VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a **Minor Industrial** permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260. The discharges result from groundwater dewatering sumps and storm water runoff from locomotive refueling and locomotive and rail care repair and maintenance activities. This permit action consists of reissuing the permit for a five-year term with limitations on pH, TSS, TOC, copper, and Oil & Grease. The permit also addresses storm water pollution prevention.

1. Facility Name and Address: SIC Code: 4011

Norfolk Southern Railway Company – Shaffers Crossing
1200 Peachtree Street NE, Box 13
Atlanta, GA 30309

Location: 24th Street & Johnson Avenue, Roanoke, VA 24017 (Roanoke City)

2. Permit No. **VA0001597** Expiration Date: August 29, 2015

3. Owner Contact: Name: Mr. Gaymeon V. Gibson Title: Environmental Compliance Officer
Telephone No: (404) 582-4239

4. Application Complete Date: July 2, 2015
Permit Drafted By: Lynn V. Wise Date: July 20, 2015
DEQ Regional Office: Blue Ridge Regional Office
Reviewed By: Lewis Pillis Date: July 24, 2015
Public Comment Period Dates: From: 7/24/15 To: 8/24/15

5. Receiving Stream Names: Lick Run, UT and Horton's Creek River Mile: 3.51 and 0.4
Basin: Roanoke River Subbasin: Roanoke River
Section: 6d Class: IV Special Standards: None

	Lick Run, UT	Horton's Creek
7-Day, 10 Year Low Flow:	0 mgd	0 mgd
1-Day, 10 Year Low Flow:	0 mgd	0 mgd
30-Day, 5-Year Low Flow:	0 mgd	0 mgd
30-Day, 10-Year Low Flow	0 mgd	0 mgd
Harmonic Mean Flow:	0 mgd	0 mgd

Tidal? YES/**NO** On 303(d) list? **YES**/NO

6. Operator License Requirements: None

7. Reliability Class: NA

8. Permit Characterization:
(X) Private ( ) Federal ( ) State ( ) POTW
( ) Possible Interstate Effect ( ) Interim Limits in Other Document (attach to Fact Sheet)

9. Description of Facility Activities:

Discharge Description

OUTFALL NUMBER	DISCHARGE SOURCE (1)	TREATMENT (2)	FLOW (3)
002/902	Ground Water Dewatering, Storm water Compressor Blowdown/Condensate	Grit Removal, Flow Equalization, Oil/Water Separator	0.043
004	Storm water associated with industrial activity	None	NA
005	Storm water associated with industrial activity	None	NA

(1) List operations contributing to flow.
(2) Give brief description, unit by unit.
(3) Give maximum 30-day average flow for industry, and design flow for municipal.

See **Attachment A** for a schematic diagram showing the wastewater treatment system and storm water drainage areas.

The Shaffers Crossing facility is a locomotive and car repair shop and refueling facility owned and operated by Norfolk Southern Railway. It operates 24 hours a day, seven days a week. Former outfalls 001 and 003 have been routed to the sanitary sewer. Storm water and ground water from the owner's property which is leased for a scrap yard by Progress Rail Services still discharges to former outfall 003 and is covered by the General Permit for Discharges of Storm Water Associated with Industrial Activity (VAR050522). Although previously reported as being routed to the sanitary sewer, it was noted during the last permit reissuance process that storm water is still discharged through outfall 004. However, the majority of the storm water from the areas most likely to be contaminated is routed to the wastewater treatment plant prior to discharge to the sanitary sewer.

Outfall 002
Dry weather discharges to 002 include ground water sump discharges from the car repair shop and hopper car wash facility as well as hump compressor blow down and condensate (which were not listed on the permit application). Compressor blowdown and condensate is collected and treated through a Beko unit. This unit, which was put into service around October 2009, was installed mainly for copper removal due to compliance difficulties at outfall 002. First the water passes through an oil/water separator, then polymer is added and the water passes through two fleece filter bags. The treated compressor condensate combines with storm water prior to final treatment and discharge at outfall 002. Wastewater from the hopper car wash facility is routed to the pretreatment plant and on to the sanitary sewer. Contents of covered hopper cars cleaned include lime, nitrogen and phosphate fertilizers, grain, and feed. Although the area is swept daily, dust from cleaning of these cars may be carried by storm water.

9. Description of Facility Activities (continued):

Storm water from the car shop and class (hump) yard is collected, routed to a treatment system and discharged through Outfall 902. The collection system has a series of small catch basins that act as grit collection points. The storm water is then directed to a grit chamber, an oil/water separator, and to a final discharge point at a storm drain to an unnamed tributary of Lick Run.

Outfall 004
This outfall receives storm water from the area around the storm water storage tanks and from the roof drains of three buildings in the area: the "mod" building (previously known as the new expedite building), the oil/test lab, and the women's locker room. The discharge is to Horton's Creek.

Outfall 005
Storm water from between the transfer table and the wheel truing building and from the locomotive maintenance shop roof drains and employee parking areas is directed to this outfall. According to agency files, a drop inlet near the northwest corner of the locomotive maintenance facility was blocked at DEQ's request after a borate solution cooling water spill in 1991. A dry weather flow has been sampled and is believed to be ground water infiltration.

Sludge Processing Area
Sludges collected from all of the grit chambers and oil/water separators are dewatered onsite and then trucked to a landfill. The sludges are collected by truck and transferred to a concrete collection tank located outside of the sludge processing building. The sludge is then pumped into the building where polymer is injected and the amended sludge is allowed to air dry on covered drying beds. The polymer tanks are located inside the building, such that any leaks would drain back to the concrete holding tank. An 8,000 gallon waste oil tank is located outside of the sludge building. Oil that is collected throughout the facility is transferred to this tank and then disposed of offsite through a contract operation. The waste oil tank has a sump which pumps rainwater and any spills over to the concrete collection tank.

Storm water from the sludge building area flows into the bermed dikes around the AST tanks by way of a gully. The bermed areas are drained onto the ground if no oil sheen is observed.

A site visit memo and additional facility information (as provided with the permit application) are included in **Attachment A**.

10. Sewage Sludge Use or Disposal: Provide a description of sewage sludge land application plan elements addressed in permit, if applicable.

Not applicable.

11. Discharge(s) Location Description: The facility is located on the Roanoke, VA Quadrangle. (Please see **Attachment A**.)

Outfall 002 location:	Latitude 37°16'44"	Longitude 79°58'18"
Outfall 004 location:	Latitude 37°16'48"	Longitude 79°58'38"
Outfall 005 location:	Latitude 37°16'49"	Longitude 79°58'38"

12. Material Storage:

As can be seen on the site map, there are numerous above ground petroleum product storage tanks onsite. All tanks are equipped with secondary containment. Additional materials are stored under roof to minimize exposure to storm water. Structural (dikes, berms, swales, ditches, and underground conveyances) and non-structural (personnel training, good housekeeping, routine inspections, and Spill Prevention, Control, and Countermeasure Plan) measures are in place to reduce pollutants in storm water run-off.

Materials include: used oil, lube oil, kerosene, journal oil, diesel fuel, gasoline, air compressor oil, hydraulic oil, fuel additive, dielectric fluid, antifreeze, propane, sulfuric acid, and mineral spirits.

Commercial herbicides are applied by a contract operation twice per year on gravel and paved areas. No herbicides are stored on-site.

Please see **Attachment A** for a site map showing location of storage tanks and a corresponding listing of quantities of materials stored.

13. Ambient Water Quality Information:

Outfall 002 discharges to an unnamed tributary to Lick Run at river mile 3.51, while outfalls 004 and 005 discharge to Horton's Creek near river mile 0.42. These receiving streams are located in the Tinker Creek/Carvin Creek/Glade Creek watershed (water body ID VAW-L05R) and are classified as Class IV (Mountainous Zone) waters with no special standards. These streams are not shown on the USGS topographical map as streams (intermittent or otherwise) as they are actually drainage ditches or storm sewers which ultimately discharge to the Roanoke River (Lick Run first enters Tinker Creek). Flow frequencies for each of the streams are zero cfs for the 1Q10, 7Q10, 30Q5, high flow 1Q10, high flow 7Q10, and harmonic mean. Please see **Attachment** B for a copy of the Flow Frequency Determination memo from 1999, which remains accurate although eliminated outfalls are also listed.

The nearest ambient water quality monitoring stations are located on the main stem of Lick Run upstream (4ALCK002.17) and downstream (4ALCK000.38) of the point where the unnamed tributary enters; the closest monitoring station on the Roanoke River is located at river mile 202.20. The most recent monitoring data are tabulated in **Attachment B**. The 2012 303(d) report lists 9.36 miles of Lick Run as impaired beginning near the Shaffers Crossing rail yard and extending downstream to the mouth of Lick Run on Tinker Creek. The segment is listed as impaired for not supporting recreational use due to exceedances of the *E. coli* bacteria criteria. This segment was initially listed in 1996 and was expanded by 5.01 miles in 2004. Similarly, the segment of the Roanoke River where Horton's Creek discharges, the segment where Lick Run enters Tinker Creek, and the segment where Tinker Creek enters the Roanoke River are listed as impaired due to bacteria. The Roanoke River is also listed due to a benthic impairment; the cause of the impairment was determined to be sediment. Finally, Tinker Creek and the Roanoke River are listed as impaired due to a fish consumption advisory due to PCBs in fish tissue. Additional details regarding the impairments can be found in the 2012 Water Quality Assessment & 303(d) Impaired Waters Fact Sheets for these segments in **Attachment B**. Additional information regarding TMDLs for this watershed can be found in Section 25 of the Fact Sheet.

As required by the application Form 2F, the permittee reported significant spills and leaks at the facility over the past few years. This list may be found in **Attachment B**.

14. Antidegradation Review & Comments:

Tier: I __X__ II_____ III_____

The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with the Tier determination. As was previously noted, both the unnamed tributary to Lick Run and Horton's Creek are intermittent streams. Intermittent streams are afforded protection as a Tier 1 water body because they cannot be reasonably expected to maintain water quality better than the standards. It is noted that at the points where the discharges converge with the Roanoke River, the river is determined to be Tier 1 based on listing on the 303(d) list of impaired waters for not supporting the aquatic life use based on benthic impairment (general standard).

Permit limits for discharges into tier 1 waters are established by determining wasteload allocations (WLAs) that will result in attaining and/or maintaining all water standards that apply to such waters, including narrative criteria. Such WLAs will provide for the protection and maintenance of all existing uses.

Therefore, at the point of the Shaffers Crossing discharges, Horton's Creek and the unnamed tributary to Lick Run are classified as **Tier 1**.

Effluent limitations are discussed in detail in Section 16 below. The discharge is in compliance with antidegradation requirements set forth in the Water Quality Standard Regulation, 9 VAC 25-260-30. The antidegradation review was conducted as described in Guidance Memorandum 00-2011, dated August 24, 2000, and complies with the antidegradation policy contained in Virginia's Water Quality Standards.

15. Site Visit: Date July 8, 2015 Performed by: Lynn V. Wise
Please see **Attachment A** for a copy of the site visit memo. A Technical, Laboratory, and Storm Water Inspection was conducted on May 8, 2013, by Mr. Ryan Hendrix, Compliance Inspector, Sr. A copy of the report is on file at the DEQ Blue Ridge Regional Office in Roanoke, VA.

16. Effluent Screening & Limitation Development:

General
A review of the DMR data for the past five years indicates the facility has been in compliance with the current limitations. The limitations from the permit were reviewed and carried forward as appropriate. Please see discussion below for each outfall. Effluent screening and limitation development documentation may be found in **Attachments C and D**.

Storm water discharges from the facility are regulated as "storm water associated with industrial activity". Evaluation of storm water management requirements is also discussed below.

16. Effluent Screening & Limitation Development:

Outfall 002

The Agency standard limits for oil/water separators and bulk oil storage are carried forward from the previous permit. This includes limits for **Oil & Grease** (average concentration 10 mg/l, maximum concentration 15 mg/l), pH (in the range of 6.0 to 9.0 su), **Total Petroleum Hydrocarbons (TPH)** (no limit, but annual monitoring required), and **Total Organic Carbon (TOC)** (maximum concentration of 110 mg/l). Limits for **Total Suspended Solids (TSS)** (average concentration 30 mg/l, maximum concentration 60 mg/l) are based on engineering judgment by a previous permit writer. Over the past permit term, there were no exceedances of these limitations. See DMR data in **Attachment C**.

Monitoring Frequency - Based on a history of consistently meeting the permit requirements, a reduction in monitoring frequency was considered on a parameter by parameter basis in accordance with agency guidance. To qualify for consideration, the facility should not have been issued any Warning Letters or Notices of Violation or be under any Consent Orders, Consent Decrees, Executive Compliance Agreements, or related enforcement documents during the past three years. The facility was found to be eligible for consideration and, based upon the evaluation of the data, frequencies have been reduced as follows: (See Attachment C for evaluation of effluent data.)

- Flow – remains 1/month (no limitation)
- pH – remains 1/month (maximum pH was within 0.5 su of the limit)
- TSS – reduced from 1/month to 1/6 months (ratio of long-term average to the permit limit <25%)
- Oil & Grease – reduced to 1/3 months (ratio of long-term average to the permit limit 49-25%)
- TOC – reduced to 1/6 months (ratio of long-term average to the permit limit <25%)
- TPH – remains 1/year (monitoring only, no limitation)
- Total Recoverable Copper – remains 1/month (ratio of long term average to permit limit 75-66%); It is noted that a QL of 20 µg/l was used instead of 10 µg/l or less as required by the permit causing difficulty in accurately evaluating the data.

Toxics – During a previous permit reissuance process, effluent data for toxic parameters were evaluated for the reasonable potential to cause or contribute to violations of the Water Quality Standards adopted by the Board. No organic parameters were detected above the Quantification Level (QL). Evaluations were made for ammonia, copper, lead and zinc based on detection in the effluent. It was determined that effluent limitations were only required for **copper** (See **Attachment D**). The limit became effective August 29, 2004. There were three exceedances of the limit in 2007. As a result, treatment was installed for the air compressor blowdown/condensate. Since that time, there have been no violations of the copper limitation. The limits of 29 µg/l monthly average and daily maximum are retained in the permit. No additional data were collected for toxic parameters during this permit term.

Total Maximum Daily Load (TMDL) Monitoring – The facility has TMDL allocations in two (2) approved TMDLs: the Benthic (Sediment) TMDL for the Roanoke River and the PCB TMDL for the Roanoke River. The benthic (TSS) TMDL has one allocation for the industrial point source (Outfall 002) and one for stormwater from the site. The TSS limits described above are the basis of the TSS allocation for this outfall. The TSS allocation was based on an average discharge of 30 mg/l at a flow rate of 0.036 MGD. The long term average TSS concentration at this outfall is 5.8 mg/l at a flow rate of 0.0056 MGD, indicating compliance with the TMDL allocation. PCB monitoring is addressed under the special conditions section of the permit (see Section 19). Storm water allocations are discussed below. Additional TMDL information can be found in Section 25 of this Fact Sheet.

16. Effluent Screening & Limitation Development (continued):

Toxics Management Program (TMP)
Biological toxicity testing was required in previous permits on the effluent from outfall 002. Annual acute testing was required using alternating between *Ceriodaphnia dubia* and *Pimephales promelas*. Quarterly chronic testing was required using both species with subsequent annual monitoring alternating between *Ceriodaphnia dubia* and *Pimephales promelas*. The data collected since 1995 are presented in **Attachment C**. The results of these tests show that there is little potential for toxicity and no limitations were required. All of the acute tests over that ten year period passed with an $LC_{50} \geq 100\%$. Likewise, all but one of the chronic tests passed with an NOEC of 100%. The one failure was due to a nonlinear dose response in the Ceriodaphnia dubia reproduction test where there was no observed adverse effect in the 100% effluent concentration. Based upon these results, no further testing has been required.

Basis for Effluent Limitations

PARAMETER	BASIS
Flow	NA – monitoring only
TSS, Oil & Grease, TOC, TPH	3, Agency Standard Limitations and Case-by-Case Decision
pH	2
Copper, Total Recoverable	2

1. Federal Effluent guidelines – cite CFR
2. Water Quality-based Limits: - show calculations or cite WQM plan reference
3. Best Engineering Judgement: - provide narrative rationale
4. Best Professional Judgement: - provide narrative rationale
5. Other (e.g. wasteload allocation model): - specify & document with model output or WLA from TMDL or basin plan

STORMWATER (Outfalls 902, 004, and 005)

Storm water is discharged from this site through three outfalls, 002 (designated as 902 for storm event monitoring), 004, and 005. All other storm water is treated and discharged to the sanitary sewer. DMR data and data provided on Form 2F can be found in **Attachment C**.

In accordance with the VPDES Permit Regulation (9 VAC 25-31-10 et seq.), storm water run-off from this site is regulated as storm water associated with industrial activity. All permits that authorize storm water discharges associated with industrial activity must include storm water management provisions. The five components of the storm water management provisions are: effluent limitations and compliance monitoring, analytical monitoring, storm water management evaluation, general storm water special conditions, and general and sector-specific storm water pollution prevention plan (SWPPP) conditions.

Based upon the Standard Industrial Classification (SIC) code of this facility, the storm water discharges are regulated under "Sector P - Land Transportation and Warehousing". EPA Effluent Guidelines do not apply to this sector; therefore, effluent limitations and compliance monitoring are not required. The 2014 reissuance of the VPDES General Permit for Discharges of Storm Water Associated with Industrial Activity included Analytical (Benchmark) Monitoring for this sector. Semiannual Total Suspended Solids (TSS) and Total Petroleum Hydrocarbons (TPH) monitoring is required. Monitoring is also being required for parameters that were detected above the EPA Benchmark values (nitrite + nitrate at outfalls 902 and 005) and parameters for which limits were previously effective (pH at outfall 005). Limits for pH and TSS at outfall 002 also apply during storm event monitoring at outfall 902. Semiannual monitoring is being implemented to be consistent with the VPDES General Stormwater permit regulation.

16. Effluent Screening & Limitation Development (continued):

TMDL Monitoring – The storm water run-off from this site discharges to an impaired water body. The approved Benthic (Sediment) TMDL for the Roanoke River includes a Total Suspended Solids allocation of 28.83 tons/year for the storm water discharges from the site. The allocation was derived assuming a concentration equal to the benchmark value of 100 mg/l (Note that outfall 902 has a TSS limit of 60 mg/l maximum). Semiannual monitoring is required at each storm water outfall. Exceedances of the TSS benchmark at outfalls 004 and 005 must be addressed through review and amendment of the SWPPP. The approved PCB TMDL allocated 35.6 mg/year to this site. PCB monitoring is addressed under the special conditions section of the permit. (See Section 19 of this Fact Sheet for additional details.) The approved bacteria TMDL for the Tinker Creek watershed did not include an allocation for this facility as it is not expected to be a source of bacteria. No bacteria monitoring is required.

The need for a storm water management evaluation is determined by comparing available storm water data to the screening criteria. Screening criteria have been established at two times the acute water quality criteria in the Water Quality Standards regulation. None of the storm water data for this facility were above the respective screening criteria. Therefore, storm water management evaluation requirements are not being implemented at this time. However, as noted above, some of the data were above the EPA Benchmark Values for non-water quality standard parameters. It is recommended that the permittee re-examine the effectiveness of the SWPPP and implement any necessary BMPs to improve the quality of the storm water leaving the site.

The final two components of the storm water management provisions will be addresses under the special conditions of the permit and Section 19 of this Fact Sheet.

17. Antibacksliding Statement:
All limitations are at least as stringent as the previous permit. The permit is in compliance with the antibacksliding policy.

18. Compliance Schedules: None

19. Special Conditions:

a. **Notification Levels**
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 A for all manufacturing, commercial, mining, and silvicultural dischargers.

b. **O&M Manual Requirement**
Rationale: Required by Code of Virginia § 62.1-44.16; VPDES Permit Regulation, 9 VAC 25-31-190 E, and 40 CFR 122.41(e). These require proper operation and maintenance of the permitted facility. Compliance with an approved O&M manual ensures this.

c. **Materials Handling/Storage**
Rationale: 9 VAC 25-31-50 A prohibits the discharge of any wastes into State waters unless authorized by permit. Code of Virginia § 62.1-44.16 and 62.1-44.17 authorizes the Board to regulate the discharge of industrial waste or other waste.

19. Special Conditions (continued):

d. **Compliance Reporting**
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

e. **Sludge Lagoon Closure Plan**
Rationale: State Water Control Law § 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. Ground water monitoring for parameters of concern will indicate whether possible lagoon seepage is resulting in violations to the State Water Control Board's Ground Water Standards.

During the early to late 1970s, the Shaffers Crossing facility operated six surface impoundments (sludge lagoons) that received wastewater treatment solids and sludges consisting mostly of dissolved air flotation (DAF) unit skimmings, oily water and grit from the oil/water separators, and oil/water emulsions from the cleaning of pollution abatement systems and equipment.

According to the "Final Closure Report for the Sludge Lagoons at the Shaffers Crossing Railyard", closure activities were conducted at the site from 1996 to 1997. This included: treatment of water and emulsified oil using a plate-and-frame filter press; solidification of sludge with boiler fly ash and portland cement; placement of the solidified sludge back into the lagoons; installation of a low-permeability geosynthetic clay liner (GCL) on top of the solidified sludge; placement of 12 inches of clean soil fill and six inches of clean topsoil above the GCL; and establishment of a grass cover at the site.

The closure plan was conditionally approved by DEQ on April 28, 1995, requiring some additional constituents be added to the post closure ground water monitoring near the lagoon site. The approved plan must be followed, but proposals for modifications to the plan may be submitted for approval by the Regional Director.

f. **Effluent Monitoring Frequency**
Rationale: Permittees are granted a reduction in monitoring frequency based on a history of permit compliance. To remain eligible for the reduction, the permittee should not have violations related to the effluent limits for which reduced frequencies were granted. If permittees fail to maintain the previous level of performance, the baseline monitoring frequencies should be reinstated for those parameters that were previously granted a monitoring frequency reduction.

g. **Total Maximum Daily Load (TMDL) Reopener**
Rationale: Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The reopener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act.

h. **Polychlorinated Biphenyl Compounds Pollutant Minimization Plan**
Rationale: State Water Control Law § 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State Waters and Section 303(d) of the Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for streams listed as impaired. Development of a PCB Total Maximum Daily Load (TMDL) requires consideration of the Virginia water quality criterion for Total PCBs (9 VAC 25-260-140) to protect the "fishable" designated use (9 VAC 25-260-10). In addition, the VPDES Permit Regulation, 9 VAC 25-31-220 K, requires the use of best management practices (BMPs) where applicable to control or abate the discharge of pollutants where numeric limitations are infeasible, or the practices are necessary to achieve effluent limitations or to carry out the purposes and intent of the State Water Control Law and the Clean Water Act. This special condition requires the development of a Pollutant Minimization Plan (PMP) to reduce PCBs in the discharge to come into compliance with the Water Quality Standards or an approved TMDL. The approved Roanoke River PCB TMDL allocates 35.6 mg/year to this facility. Dry and wet weather PCB Monitoring was performed during the last permit term. All of the information required by DEQ Guidance has yet to be submitted with the data; therefore, only a qualitative evaluation of the data has been performed by TMDL staff. The dry data (Outfall 002) appears to be below the human health water quality criterion of 640 pg/l, while the wet weather data appears to exceed the criterion. In accordance with agency guidance, a PMP is required if the sampling results indicate a reasonable potential to exceed the water quality criterion. The contents of the PMP should follow the outline presented in **Attachment C** of this Fact Sheet.

i. **Storm Water Management**
Rationale: VPDES Permit Regulation 9 VAC 25-31-10 defines discharges of storm water from industrial activity in nine industrial categories. 9 VAC 25-31-120 requires a permit for these discharges. The Storm Water Pollution Plan requirements of the permit are derived from the VPDES general permit for discharges of storm water associated with industrial activity, 9 VAC 25-151-10 et seq. VPDES Permit Regulation, 9 VAC 25-31-220 K, requires the use of best management practices where applicable to control or abate the discharge of pollutants when numeric effluent limitations are infeasible or the practices are necessary to achieve effluent limit or to carry out the purpose and intent of the Clean Water Act and State Water Control Law.

The storm water management requirements of the permit are divided into four sections: Storm Water Management Evaluation, General Storm Water Special Conditions, General Storm Water Pollution Prevention Plan Requirements, and Sector-Specific Storm Water Pollution Prevention Plan Requirements.

j. **Part II, Conditions Applicable to All Permits**
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

20. NPDES Permit Rating Work Sheet: Total Score_____20_____

Please see **Attachment A** for completed rating work sheet. There have been no changes since the last permit reissuance.

21. Changes to Permit:

Changes in Effluent Monitoring/Limitations:

Outfall No.	Parameter Changed	Monitoring Requirement Changed		Effluent Limits Changed		Reason	Date
		From	To	From	To		
002	Oil & Grease	1/month	1/3M	---	---	reduced monitoring granted based on past performance	7/16/15
002	Total Suspended Solids (TSS) and Total Organic Carbon (TOC)	1/month	1/6M	---	---	reduced monitoring granted based on past performance	7/16/15
902 and 005	Total Petroleum Hydrocarbons (TPH), pH, Nitrite + Nitrate	1/year	1/6M	---	---	VPDES General Industrial SW permit requires semiannual monitoring	7/16/15
004	Total Petroleum Hydrocarbons (TPH)	1/year	1/6M	---	---	VPDES General Industrial SW permit required semiannual monitoring	7/16/15

Changes to Special Conditions:

O&M Manual – updated to reflect current language
Compliance Reporting – Updated to reflect current language; provides permittee with quantification levels and reporting requirements.
Sampling for Fulfill Form 2F Requirements – Removed. A completed Form 2F was submitted for all storm water outfalls.
Effluent Monitoring Frequencies – Added to provide instructions regarding reduced monitoring frequencies
PCB PMP Plan – The monitoring condition was replaced with the requirement for a Pollutant Minimization Plan because the facility has a PCB allocation in the approved TMDL and data show a reasonable potential to exceed the water quality criteria or wasteload allocation.
Storm Water Management – Update to reflect current language as found in the VPDES General Permit for Storm Water Discharges. Also added Storm Water Management Evaluation language to provide comparative values for review of SWPPP.

22. Variances/Alternate Limits or Conditions:

The facility requested and was granted a waiver for application monitoring for BOD, COD and ammonia at outfall 002. There is no source of these pollutants in the discharge and therefore, the pollutants are not of material concern. Historic data is available on file at the Regional Office.

The facility was found to be eligible for reduced monitoring frequencies based upon past performance. These reduced frequencies are incorporated on the Effluent Limitations page for Outfall 002. A special condition is included to return to the previous frequencies should a violation occur.

23. Public Notice Information required by 9 VAC 25-31-280 B:

All pertinent information is on file and may be inspected or copied by contacting Lynn V. Wise at:

Virginia DEQ, Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019
Telephone No. (540) 562-6787
E-mail lynn.wise@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions.

Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may review the draft permit and application at the DEQ Blue Ridge Regional Office in Roanoke by appointment.

24. Additional Comments:

Previous Board Action: None.

Staff Comments:

A screening for Threatened and Endangered (T&E) Species in the vicinity of the Norfolk Southern Shaffers Crossing facility was performed and a T&E Species Coordination Form package was submitted to the Department of Game and Inland Fisheries, the Department of Conservation and Recreation, and the United States Fish & Wildlife Service. The purpose of the screening is to assure that mixing zones do not impact listed species. Because the discharges from this facility are to streams with critical flows equal to zero, no mixing zones are allowed. The federal Species of Concern state Threatened (FSST) orangefin madtom and federal Endangered state Endangered (FESE) Roanoke logperch are known from the area. The Roanoke River is a designated Threatened and Endangered (T&E) species water for these species. Since no mixing zones are allowed and the effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC-25-260-00 et seq., no adverse impacts to these species are expected. Further documentation of the T&E species review can be found in the Agency's files at the Regional Office.

The discharge is not controversial and is currently meeting the required effluent limitations. The discharges are in conformance with the existing TMDL planning documents for the area.

24. Additional Comments:

Public Comments: No comments were received during the comment period.

Other Agency Comments: VDH noted that the nearest downstream raw water intake is located approximately 31 miles from the discharge area and that no wells were found within a 1-mile radius from the discharges. EPA had no comments concerning the TMDL requirements.

25. 303(d) Listed Segments (TMDL):

Bacteria - Outfall 002/902 from this facility discharges directly to an unnamed tributary to Lick Run. The 2012 303(d) report lists 9.36 miles of Lick Run as impaired beginning near the Shaffers Crossing rail yard and extending downstream to the mouth of Lick Run on Tinker Creek. The segment is listed as impaired for not supporting recreational use due to exceedances of the *E. coli* bacteria criteria. This segment was initially listed in 1996 and was expanded by 5.01 miles in 2004. EPA approved the Fecal Coliform TMDL for Glade Creek, Tinker Creek, Carvin Creek, Laymantown Creek and Lick Run on August 5, 2004. It does not contain a WLA for this discharge. No limit for fecal coliform/bacteria is included in this permit because the effluent does not contain fecal coliform.

Storm water outfalls 004 and 005 discharge to Horton's Creek, which enters the Roanoke River. This segment of the Roanoke River is listed due to bacteria impairment. EPA approved the Bacteria TMDLs for Wilson Creek, Ore Branch and Roanoke River Watersheds on August 2, 2006. It does not contain a WLA for this facility. No limit for *E. coli*/bacteria is included for these outfalls because the effluent does not contain *E.coli.*

Benthic (Sediment) – The Roanoke River watershed to which this facility discharges is listed on the 2012 303(d) list for a benthic impairment. The Benthic (Sediment) TMDL for the Roanoke River, which was approved on May 10, 2006, contains two allocations for this facility. The wastewater discharge from outfall 002 received an allocation of 1.62 tons/year, consistent with the current effluent limits (30 mg/l monthly average). The storm water discharges from the site received an allocation of 28.83 tons/year. This allocation was based on a benchmark value of 100 mg/l. It is noted that an effluent limit of 60 mg/l maximum is required at outfall 902. Achievement of compliance with the EPA Benchmark value for TSS at the remaining storm water outfalls is expected to maintain compliance with the TMDL allocation.

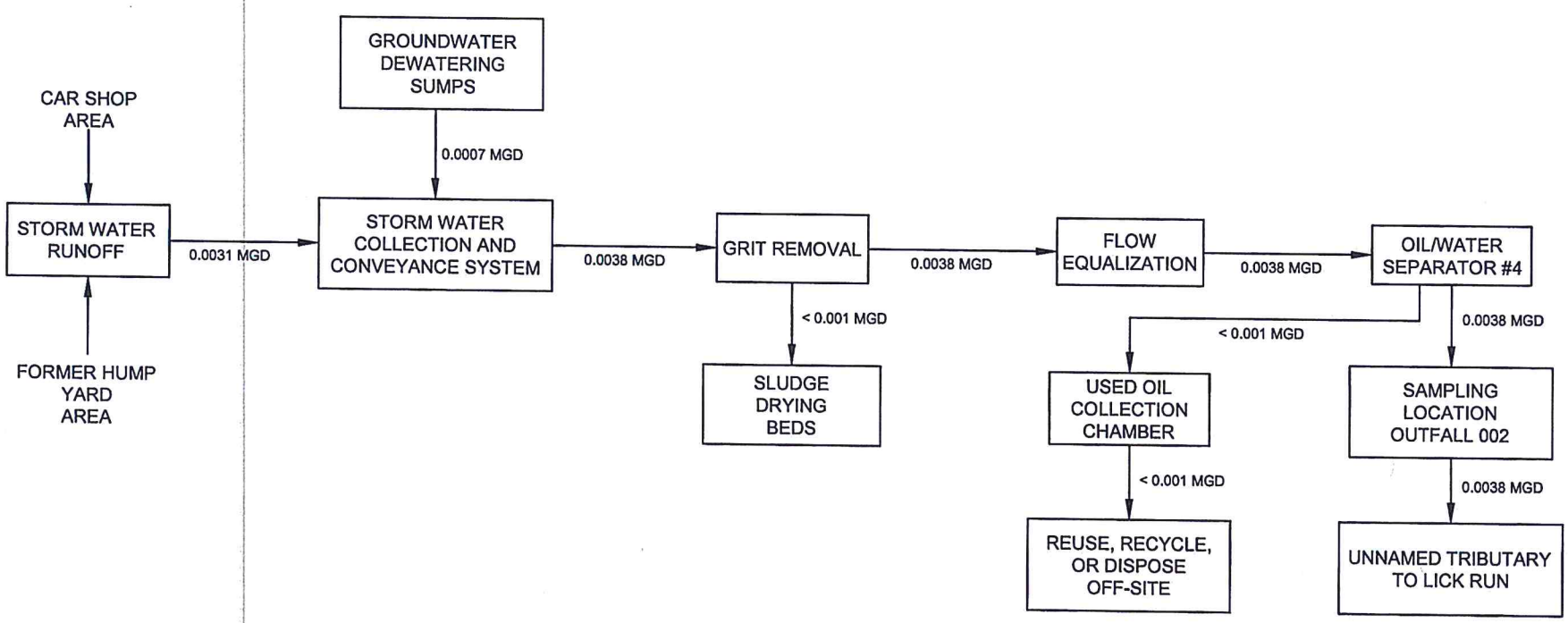
Polychlorinated Biphenyl Compounds (PCBs) – Tinker Creek and the Roanoke River are listed as impaired on the 2012 303(d) list due to a fish consumption advisory due to PCBs in fish tissue. The PCB TMDL for the Roanoke River, which was approved on April 9, 2010, includes an allocation of 35.6 mg/year for this facility. Monitoring during the past permit term appears to indicate the reasonable potential for the storm water discharges to exceed the human health water quality criterion. Therefore, in accordance with agency guidance, a PCB Pollutant Minimization Plan is being required by this permit with a goal of identifying and reducing potential sources of PCBs in the discharges. The requirements of the PCB PMP are included in Attachment C.

Additional details regarding the impairments can be found in the 2012 Water Quality Assessment & 303(d) Impaired Waters Fact Sheets for these segments in **Attachment B**.

ATTACHMENT A

GENERAL FACILITY INFORMATION

1. Process Flow Diagram
2. Storm Water Drainage Area Map
3. Site Visit Memo
4. Significant Materials Stored
5. Location Topographic Map
6. NPDES Permit Rating Worksheet



Cardno Shaping the Future Bluefield, VA	Drawn: TA Checked: MN Date: 02/20/2015 Scale: NTS Project No.: NS1789/58 File No. SCHEMAT~	NTS 0 NTS NOT TO SCALE	SHAFFER'S CROSSING ROANOKE, VIRGINIA	Figure 4 PROCESS FLOW DIAGRAM

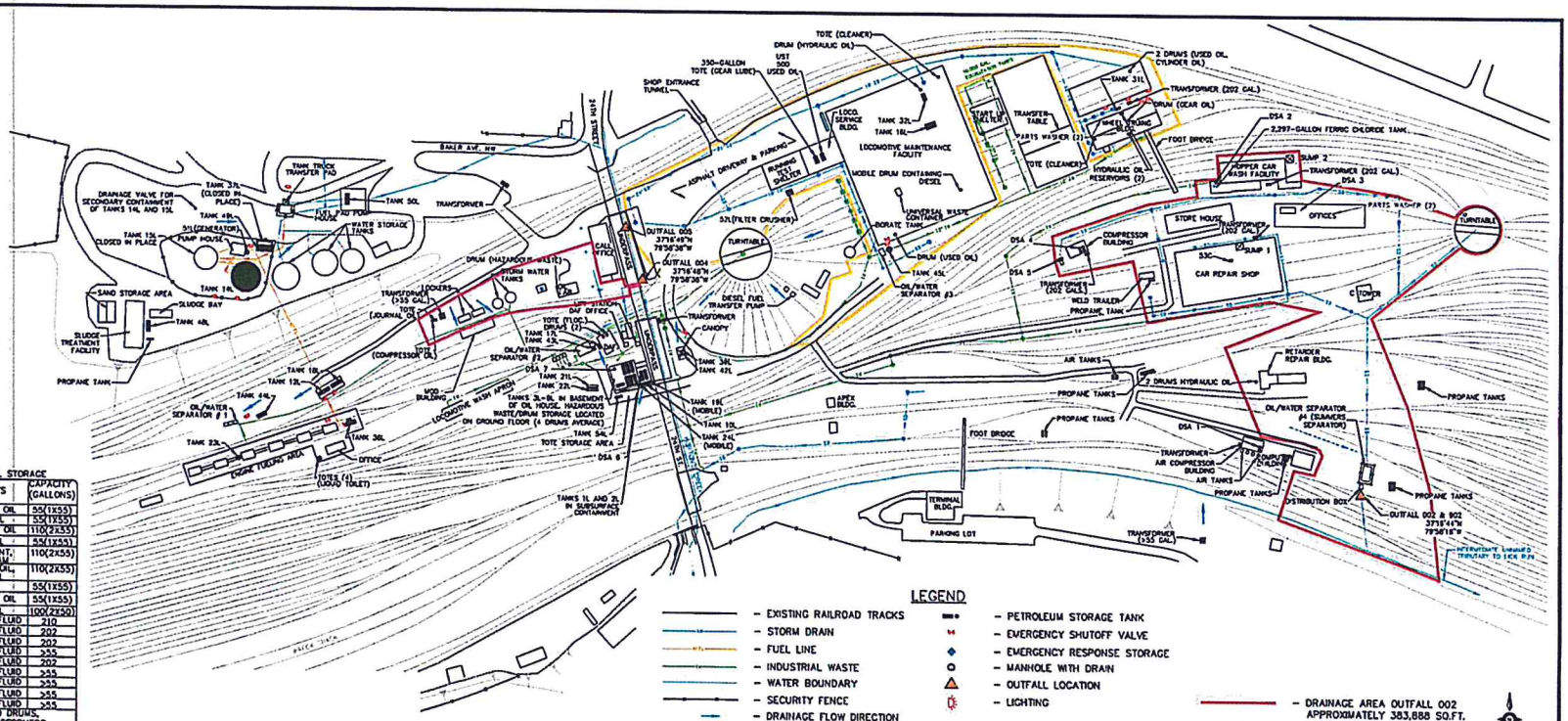
SIGNIFICANT MATERIAL STORAGE

CONTAINER	CONTENTS	CAPACITY (GALLONS)
1L	USED OIL	10,000
2L	USED OIL	10,000
3L	LUBE OIL	7,000
4L	LUBE OIL	7,000
5L	KEROSENE	3,000
6L	LUBE OIL	7,000
7L	LUBE OIL	7,000
8L	LUBE OIL	7,000
9L	LUBE OIL	7,000
10L	JOURNAL OIL	8,000
12L	LUBE OIL	10,000
14L	DIESEL	741,000
16L	COMPRESSOR OIL	1,000
17L	SLUDGE	8,000
18L	LUBE OIL	10,000
19L	KEROSENE	275
21L	CLEANER	10,000
22L	CLEANER	10,000
23L	COMPRESSOR OIL	550
24L	CAR OIL	275
31L	HYDRAULIC OIL	500
32L	LUBE OIL	275
36L	CAR OIL	1,000
39L	GASOLINE	500
42L	DIESEL	1,000
43L	USED OIL	1,000
44L	USED OIL	8,000
45L	USED OIL	6,000
48L	USED OIL	1,000
49L	DIESEL ADDITIVE	2,000
50L	DIESEL OVERFLOW	10,000
51L	DIESEL	415
52L	HYDRAULIC OIL	185
53C	HYDRAULIC OIL	213
54L	LUBE OIL	275
UNASSIGNED	FERRIC CHLORIDE	2,297
TOTE	GEAR LUBE	350
TOTES (2)	JOURNAL & COMPRESSOR OIL	660
TOTES	LIQUID TOILET	1,320
TOTE STORAGE AREA (12)	ENGINE OIL, GEAR OIL, HYDRAULIC OIL, JOURNAL OIL, CLEANER, LIQUID TOILET	3,960
TOTE	FLOCCULENT	330
TOTE	CLEANER	330
TOTE	CLEANER	330
HYDRAULIC OIL RESERVOIRS (2)	HYDRAULIC OIL	125
DSA 1	COMPRESSOR OIL	220(4X55)
DSA 2	FLOCCULENT, SODIUM HYDROXIDE NOVAC A-80	220(4X55)
DSA 3	USED OIL, KEROSENE, XYLENE, MINERAL SPIRITS, BOILER TREATMENT, SODIUM HYDROXIDE	440(8X55)
DSA 4	COMPRESSOR OIL	330(6X55)
DSA 5	EMPTY	110(2X55)
DSA 6	COMPRESSOR OIL, USED OIL	385(7X55)
DSA 7	TRANSFORMER OIL, AIR COMPRESSOR OIL, EMPTY	715(13X55)
HAZARDOUS WASTE STORAGE AREA	HAZARDOUS WASTE	220(4X55)
DRUM	HAZARDOUS WASTE	55(1X55)

SIGNIFICANT MATERIAL STORAGE

CONTAINER	CONTENTS	CAPACITY (GALLONS)
DRUM	HYDRAULIC OIL	55(1X55)
DRUM	GEAR OIL	55(1X55)
DRUMS	HYDRAULIC OIL	110(2X55)
DRUM	USED OIL	55(1X55)
DRUMS	FLOCCULENT; ANTI-FOAM	110(2X55)
DRUMS	CYLINDER OIL, USED OIL	110(2X55)
DRUM	DIESEL	55(1X55)
DRUM	HYDRAULIC OIL	55(1X55)
55 GAL TANKS	USED OIL	100(2X50)
TRANSFORMER	DIELECTRIC FLUID	210
TRANSFORMER	DIELECTRIC FLUID	202
TRANSFORMER	DIELECTRIC FLUID	202
TRANSFORMER	DIELECTRIC FLUID	>55
TRANSFORMER	DIELECTRIC FLUID	202
TRANSFORMER	DIELECTRIC FLUID	>55
TRANSFORMER	DIELECTRIC FLUID	>55
TRANSFORMER	DIELECTRIC FLUID	>55

36 TANKS, 22 TOTES, 60 DRUMS, 2 OIL RESERVOIRS, 9 TRANSFORMERS, 2 50-GALLON TANKS
TOTAL CAPACITY: 910,161 GAL.



Cardno Shaping the Future

NORFOLK SOUTHERN

		NO	DATE	REVISION
DESIGNED	MN			
DRAWN	TANNER P.			
CHECKED	MN			
DATE	9/29/2015			
SCALE	1" = 100'			
FILE NO	Shaffer Site			
PROJECT NO	96379.100			
OFFICE LOC	Bluefield, VA			

NORFOLK SOUTHERN RAILWAY COMPANY
SHAFFERS CROSSING
ROANOKE, VIRGINIA

FACILITY LAYOUT AND DRAINAGE PLAN

Figure 2

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office, Water Division

3019 Peters Creek Road Roanoke, VA 24019

SUBJECT: Site Visit – Norfolk Southern Shaffers Crossing
VPDES Permit No. VA0001597

TO: File

FROM: Lynn V. Wise, Environmental Engineer, Sr.

DATE: July 9, 2015

COPIES:

A site visit was conducted at the referenced facility on July 8, 2015, for the purpose of permit reissuance. Present representing Norfolk Southern were: Mr. Troy Carpenter, Regional Manager, Environmental Operations; Ms. Ava Ray, Mechanical Supervisor; and Mr. Mark Neal, Environmental Compliance Manager, Cardno.

The Shaffers Crossing facility is a locomotive and car repair shop and refueling facility owned and operated by Norfolk Southern Railway. It operates 24 hours per day, seven days per week. Wastewater that discharged through former outfalls 001 and 003 has been routed to the sanitary sewer. Storm water and ground water from the owner's property which is leased for a scrap yard by Progress Rail Services still discharges to outfall 003 and is covered by the General Permit for Discharges of Storm Water Associated with Industrial Activity (VAR050522). Although previously reported as being routed to the sanitary sewer, it was discovered during the last permit reissuance process that storm water is still discharged through outfall 004. Storm water is also discharged through outfalls 005 and 902. The majority of the storm water from the areas most likely to be contaminated is routed to the wastewater treatment plant prior to discharge to the sanitary sewer. Cardno (formerly Marshall Miller and Associates) samples the outfalls for DMR reporting and the permit application.

VPDES Permit No. VA0001597 authorizes discharges from outfalls 002/902, 004, and 005. Each of these discharges is discussed below.

Outfall 002/902

Dry weather discharges to 002 include ground water sump discharges from the car repair shop and hopper car wash facility as well as hump compressor blow down and condensate (which were not listed on the permit application). Wastewater from the hopper car wash facility is pre-treated at the hopper car wash building prior to being routed to the DAF/pretreatment plant and on to the sanitary sewer. Compressor blowdown and condensate is collected and treated through a Beko unit. This unit, which was put into service around October 2009, was installed mainly for copper removal due to compliance difficulties at outfall 002. First the water passes through an oil/water separator, then polymer is added and the water passes through two fleece filter bags. The filters are replaced approximately once per month depending on the season. The treated compressor condensate combines with the other flows prior to final treatment and discharge at outfall 002. The final treatment is discussed below.

Storm water associated with industrial activity is also discharged through outfall 002 (designated as 902 in the VPDES permit). Storm drains collect water from around the car repair shop, the hopper car wash facility, the house air compressor building, a turntable, and drop inlets leading to Oil/Water Separator #4 (Summers Separator). Before cement cars are washed, dried cement is broken off of the cars with a pneumatic hammer. Waste cement is carried by covered conveyor to a covered roll off container which is emptied by a contractor (currently Waste Management) and disposed of in a landfill. Waste from cleaning out all other kinds of hopper cars is also collected by Waste Management for disposal. This area and the area around the repair shop are swept daily. Parts for the hopper cars are stored in the area between the buildings and minor repairs are performed in outside areas. No evidence of oil leaks was observed.

Treatment of the aforementioned wastewaters is performed via an 8x8x8 ft grit chamber and an oil/water separator. Waste oil is pumped into an adjacent waste oil tank weekly. Grit in each unit is cleaned out twice a year. Water discharged from the separator flows through a v-notch weir into a distribution box. A bypass line connecting the inlet box and the distribution box (by-passing the oil/water separator) is plugged on the exit end. The unnamed tributary to Lick Run was dry. Sampling for outfall 002 is performed at the exit of the oil/water separator, while storm event sampling (902) is performed in the distribution box.

Outfall 004

At one time, it was erroneously indicated that this outfall had been connected to the sanitary sewer. However, this outfall receives storm water from the area around the storm water storage tanks and from the roof drains of three buildings in the area: the "mod" building (previously called the new expedite building), the oil/test lab, and the women's locker room. The discharge is to Horton's Creek.

Outfall 005

Storm drains collecting water from between the transfer table and the wheel truing building and from the locomotive maintenance facility roof drains discharge through outfall 005. A large portion of this drainage area is from parking areas and site roadways. All storm water from the apron and turntable is routed to the sanitary sewer. The outfall discharges to Horton's Creek. Dry weather discharge from this pipe occurs due to ground water infiltration into the pipeline. A previous permit required a dry weather sample of this discharge to verify this assertion.

Wastewater Treatment Plant

Hopper car wash water, locomotive wash water, house air compressor blowdown and condensate, water discharged from various oil/water separators including storm water from the engine fueling area, apron and main turntable areas are treated at the wastewater treatment plant prior to discharge to the sanitary sewer. The water is pumped to a grit chamber followed by an oil/water separator and a dissolved air flotation (DAF) unit. Three polymers, stored in 1600 gallon tanks, are injected into the wastewater prior to the DAF (836A, 509, and 607). The effluent from the DAF is routed to the sanitary sewer. Waste oil is skimmed off of the oil/water separator and stored in a nearby tank. (Used oil is transported off-site by Spirit Services.) Sludge from the top of the DAF is stored in a 1000-gal tank just outside the DAF building. Water can be pumped to the treatment system at a maximum rate of 360 gpm. Should the capacity of the treatment system be exceeded (e.g. during a heavy storm event), the oil/water separator is valved off and a lift station pumps the water to two storm water holding tanks. As the flows decrease, the stored water is fed to the treatment system.

Sludge Treatment Facility

Sludges collected from all of the grit chambers and oil/water separators are treated onsite and disposed of by a contractor (currently Domermuth Environmental Services). The sludges are collected by truck and hauled to the sludge bay, which is a 12 foot deep pit. On a daily basis, approximately 3500 gallons of sludge is pumped inside the sludge treatment facility, treated with polymer, and placed on sand drying beds for one week to one month. The dried sludge is manually shoveled onto a conveyor that transports the sludge outside to a front end loader. It is then loaded into a hopper. When full, a contract service removes the sludge. The liquid that drains off the drying beds is routed back to the pretreatment system for treatment prior to discharge into the sanitary sewer.

General

Commercial herbicides are applied by a contract operation two times per year on gravel and paved areas. No herbicides are stored on-site.

ABOVEGROUND STORAGE CONTAINERS*

Container	Capacity (gal)	Contents	Horizontal/ Vertical H/V	Supporting Structure	Department	Secondary Containment Type	Drainage Flow (See Site Maps)
1L	10,000	Used Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
2L	10,000	Used Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
3L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
4L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
5L	3,000	Kerosene	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
6L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
7L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
8L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
9L	7,000	Lube Oil	H	Concrete	Mechanical	Oil House Basement (Concrete)	Drainage is routed to Oil/Water Separator #2.
10L	8,000	Journal Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the south.

ABOVEGROUND STORAGE CONTAINERS*

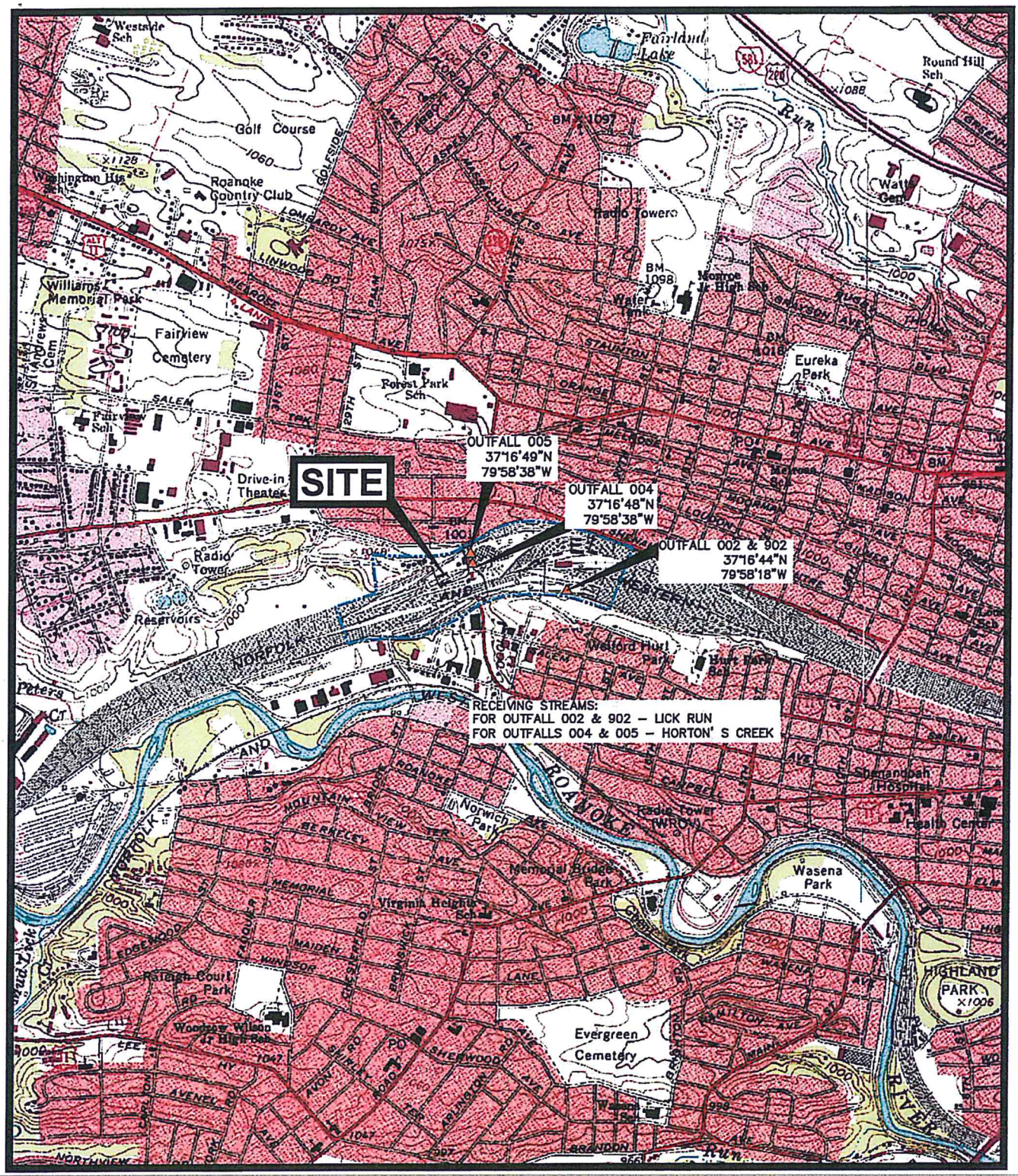
(Continued)

Container	Capacity (gal)	Contents	Horizontal/ Vertical H/V	Supporting Structure	Department	Secondary Containment Type	Drainage Flow (See Site Maps)
12L	10,000	Lube Oil	H	Concrete	Mechanical	Geomembrane Lined Concrete Dike	Secondary containment structure would drain to ground surface. Flow is then to the southwest.
14L	741,000	Diesel Fuel	V	Concrete	Mechanical	Geomembrane Lined Earthen Dike	Secondary containment structure would drain to ground surface. Flow is then to the east
16L	1,000	Compressor Oil	H	Concrete	Mechanical	Drains to OWS	Drainage is routed to Oil/Water Separator #3.
17L	8,000	Sludge	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the south.
18L	10,000	Lube Oil	H	Concrete	Mechanical	Geomembrane Lined Concrete Dike	Secondary containment structure would drain to ground surface. Flow is then to the southwest.
19L	275	Kerosene	H	Steel	Mechanical	Mobile	NA
23L	550	Compressor Oil	V	Concrete	Mechanical	Drains to OWS	Drainage is routed to Oil/Water Separator #1.
24L	275	Car Oil	H	Concrete	Mechanical	Mobile	NA
30L	300	Hydraulic Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the west.
31L	300	Hydraulic Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the west.
32L	275	Lube Oil	H	Concrete	Mechanical	Drains to OWS	Drainage is routed to Oil/Water Separator #3.
36L	1,000	Car Oil	H	Concrete	Mechanical	Concrete Dike	Secondary containment structure would drain to ground surface. Flow is then to the west.
37L	10,000	Fuel Additive	H	Concrete	Mechanical	Concrete Dike	Secondary containment structure would drain to ground surface.

ABOVEGROUND STORAGE CONTAINERS*

(Continued)

Container	Capacity (gal)	Contents	Horizontal/ Vertical H/V	Supporting Structure	Department	Secondary Containment Type	Drainage Flow (See Site Maps)
39L	500	Gasoline	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the northeast.
42L	1,000	Diesel Fuel	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the northeast.
43L	1,000	Used Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the south.
44L	8,000	Used Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the west.
45L	3,000	Used Oil	V	Concrete	Mechanical	Double Walled	Drainage is routed to Oil/Water Separator #3.
46L	500	Used Oil	H	Steel	Mechanical	Tent Tank	Secondary containment structure would drain to ground surface. Flow is then to the southeast.
47L	4,000	Diesel Overflow	H	Steel	Mechanical	Concrete Walls	Secondary containment structure would drain to ground surface.
2MW	300	Used Oil	H	Concrete	Maintenance -of-Way	Concrete Vault	Drainage is routed to a floor drain which discharges to a 1,000 gallon concrete vault.
3MW	550	Diesel Fuel	H	Concrete	Maintenance -of-Way	Concrete Vault	Drainage is routed to a floor drain which discharges to a 1,000 gallon concrete vault.
Unassigned	500	Used Oil	H	Steel	Mechanical	Tent Tank	Secondary containment would drain to ground surface. Flow is then to the northeast.
Drums	~880	Various	NA	NA	Various	Controlled Drainage	Drums are placed in areas where a release would discharge to a treatment system.
Transformers	~700	Dielectric Fluid	NA	NA	Various	NA	A release would pool on nearby ground surface.



SOUTHEAST PORTION OF USGS 7.5' ROANOKE, VA QUADRANGLE

Cardno
Shaping the Future

Norfolk Southern Railway Company
Shaffer's Crossing

2,000' 0 2,000'

SCALE 1:24,000

VIRGINIA
QUADRANGLE LOCATION

NS1789-108
02/02/2015
Bluefield, Virginia

Topographic Site Location Map

FIGURE 1

PDES Permit Rating Work Sheet

___ Regular Addition
___ Discretionary Addition
_✓_ Score change, but no status change
___ Deletion

NPDES NO: VA0001571

Facility Name: NORFOLK SOUTHERN RAILWAY CO SHAFFERS

City: ROANOKE

Receiveing Water: HORTONS BRANCH & UT TO LICK RUN

Reach Number: ____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?

1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate

___ YES: score is 600 (stop here) _X_ NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

___ YES; score is 700 (stop here)
_X_ NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: ____ Primary SIC Code: 4011

Other SIC Codes: ____ ____ ____ ____

Industrial Subcategory Code: ____ (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
_X_ No process waste streams	0	0	___ 3.	3	15	___ 7.	7	35
___ 1.	1	5	___ 4.	4	20	___ 8.	8	40
___ 2.	2	10	___ 5.	5	25	___ 9.	9	45
			___ 6.	6	30	___ 10.	10	50

Code Number Checked: 0

Total Points Factor 1: 0

FACTOR 2: Flow/Stream Flow Volume *(Complete Either Section A or Section B; check only one)*

Section A–Wastewater Flow Only Considered

Wastewater Type (See Instructions)			Code	Points
Type I:	Flow < 5 MGD	___	11	0
	Flow 5 to 10 MGD	___	12	10
	Flow > 10 to 50 MGD	___	13	20
	Flow > 50 MGD	___	14	30
Type II:	Flow < 1 MGD	_X_	21	10
	Flow 1 to 5 MGD	___	22	20
	Flow > 5 to 10 MGD	___	23	30
	Flow > 10 MGD	___	24	50
Type III:	Flow < 1 MGD	___	31	0
	Flow 1 to 5 MGD	___	32	10
	Flow > 5 to 10 MGD	___	33	20
	Flow > 10 MGD	___	34	30

Section B–Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of Instream Wastewater Concentration at Receiveing Stream Low Flow		Code	Points
Type I/III:	< 10%	___	41	0
	≥ 10% to < 50%	___	42	10
	≥ 50%	___	43	20
Type II:	<10%	___	51	0
	≥ 10% to < 50%	___	52	20
	≥ 50%	___	53	30

Code Checked from Section A or B: 21

Total Points Factor 2: 10

NP 'S Permit Rating Work Sheet

NPDES No.: |V|A|0|0|2|1|5|9|7|

FACTOR 3: Conventional Pollutants
(only when limited by the permit)

A. Oxygen Demanding Pollutant: (check one) ___ BOD ___ COD ___ Other: _____

Permit Limits: (check one)		Code	Points
___	< 100 lbs/day	1	0
___	100 to 1000 lbs/day	2	5
___	>1000 to 3000 lbs/day	3	15
___	>3000 lbs/day	4	20

NA

Code Checked: |___| NA
Points Scored: |___|___|

B. Total Suspended Solids (TSS)

Permit Limits: (check one)		Code	Points
X	< 100 lbs/day	1	0
___	100 to 1000 lbs/day	2	5
___	>1000 to 5000 lbs/day	3	15
___	>5000 lbs/day	4	20

Code Checked: |1|
Points Scored: |___|0|

C. Nitrogen Pollutant: (check one) ___ Ammonia ___ Other: _____

Permit Limits: (check one)		Code	Points
___	< 300 lbs/day	1	0
___	300 to 1000 lbs/day	2	5
___	>1000 to 3000 lbs/day	3	15
___	>3000 lbs/day	4	20

NA

Code Checked: |___| NA
Points Scored: |___|___|

Total Points Factor 3: |___|0|

FACTOR 4: Public Health Impact
Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

✓ YES (if yes, check toxicity potential number below) High Point
___ NO (if no, go to Factor 5)

Determine the human health toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column – check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
X No process waste streams	0	0	___ 3.	3	0	___ 7.	7	15
___ 1.	1	0	___ 4.	4	0	___ 8.	8	20
___ 2.	2	0	___ 5.	5	5	___ 9.	9	25
			___ 6.	6	10	___ 10.	10	30

Code Number Checked: |___|0|
Total Points Factor 4: |___|0|

NPDES Permit Rating Work Sheet

NPDES No.: VA0001597

FACTOR 5: Water Quality Factors

A. *Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge?*

		Code	Points
✓	Yes	1	10
	No	2	0

B. *Is the receiving water in compliance with applicable water quality statndards for pollutants that are water quality limited in the permit?*

fecal impaired
copper limits

		Code	Points
✓	Yes	1	0
	No	2	5

C. *Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?*

		Code	Points
	Yes	1	10
✓	No	2	0

Code Number Checked: A 1 B 1 C 2

Points Factor 5: A 10 + B 0 + C 0 = 10 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. *Base Score: Enter flow code here (from Factor 2):* 21

Enter the mulltiplication factor that corresponds to the flow code: ___

Check appropriate facility HPRI Code (from PCS):

	HPRI #	Code	HPRI Score
	1	1	20
	2	2	0
	3	3	30
✓	4	4	0
	5	5	20

Flow Code	Multiplication Factor
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

HPRI code checked: ___

Base Score: (HPRI Score) 0 x (Multiplication Factor) 0.1 = 0 (TOTAL POINTS)

B. *Additional Points–NEP Program*
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

		Code	Points
	Yes	1	10
✓	No	2	0

C. *Additional Points–Great Lakes Area of Concern*
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see instructions)

		Code	Points
✓	Yes	1	10
	No	2	0

Code Number Checked: A 4 B 2 C 2

Points Factor 5: A 0 + B 0 + C 0 = 0 TOTAL

NF__'S Permit Rating Work Sheet

NPDES NO: VA0001597

SCORE SUMMARY

Factor	Description	Total Points
1	Toxic Pollutant Potential	0
2	Flow/Stream Flow Volume	10
3	Conventional Pollutants	0
4	Public Health Impacts	0
5	Water Quality Factors	10
6	Proximity to Near Coastal Waters	0
	TOTAL (Factors 1-6)	20

S1. Is the total score equal to or greater than 80? ___ Yes (Facility is a major) ✓ No

S2. If the answer to the above question is no, would you like this facility to be discretionary major?

___ No

___ Yes (add 500 points to the above score and provide reason below:

Reason: _____

NEW SCORE: 20

OLD SCORE: 35

Lewis J Pillis

Permit Reviewer's Name

(540) 562-6789

Phone Number

4-18-00

Date

ATTACHMENT B

RECEIVING STREAM INFORMATION

1. Flow Frequency Memo
2. 4ALCK000.38 Ambient Data
3. 4ALCK002.17 Ambient Data
4. 4AROA202.20 Ambient Data
5. WQ Assessment and Impaired Waters Fact Sheets
6. Excerpts from Applicable TMDLs
7. Significant Spills & Leaks

LAP
DMMc

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Office of Water Quality Assessments
629 East Main Street P.O. Box 10009 Richmond, Virginia 23219

SUBJECT: Flow Frequency Determination
Norfolk Southern RR, Shafers Crossing – #VA0001597

TO: Lewis Pillis, WCRO

FROM: Paul E. Herman, P.E., WQAP

DATE: May 24, 1999

COPIES: Ron Gregory, Charles Martin, File

RECEIVED
MAY 25 1999
DEQ-WCRO

This memo supersedes my July 28, 1994, memo to you concerning the subject VPDES permit.

The Norfolk Southern RR –Shafers Crossing discharges via several outfalls located on the Hortons Branch (001, 004, and 005), North Fork Lick Run (002), an unnamed tributary (006), and the Roanoke River (003), in Roanoke, Virginia. Stream flow frequencies are required at these sites for use by the permit writer in developing the VPDES permit.

The Hortons Branch, North Fork Lick Run and the unnamed tributary are not shown on the USGS Roanoke Quadrangle topographic map as streams, intermittent or otherwise. The map indicates these disharge receiving streams may be unnamed drainage ditches or storm sewers. The flow frequencies for storm sewers or drainage ditches are 0.0 cfs for the 1Q10, 7Q10, 30Q5, high flow 1Q10, high flow7Q10, and harmonic mean. The storm drains probably discharge to the Roanoke River in the vicinity of outfall 003. The flow frequencies for the Roanoke River are presented below for outfall 003.

The USGS has operated a continuous record gage on the Roanoke River at Roanoke, VA (#02076000) since 1899. The gage is located 3.0 miles downstream of the discharge point. The flow frequencies for the gage are based on the unregulated period of record from 1950 to 1993. Prior to 1950, flows were regulated by power plants upstream. Since 1994, flow has been regulated by withdrawals by Roanoke County for public use. The flow frequencies for the discharge point were determined using drainage area proportions and do not address any withdrawals, discharges, or springs that may lie between the gage and outfall 003. The flow frequencies for the gage and the discharge point are presented below.

Roanoke River at Roanoke, VA (#02055000):

Drainage Area = 395 mi^2

1Q10 = 33 cfs	High Flow 1Q10 = 68 cfs
7Q10 = 37 cfs	High Flow 7Q10 = 81 cfs
30Q5 = 53 cfs	HM = 148 cfs

Roanoke River at Shafers Crossing outfall 003:

Drainage Area = 383.82 mi^2

1Q10 = 32 cfs	High Flow 1Q10 = 66 cfs
7Q10 = 36 cfs	High Flow 7Q10 = 79 cfs
30Q5 = 51 cfs	HM = 144 cfs

The high flow months are January through May. If you have any questions concerning this analysis, please let me know.

Station ID 4ALCK000.38				00076	00095	00310	00403	00410	00500	00505	00510	00515	00530	00535	00540	00600	0061
				Turbidity	Sp Cond	BOD_5	pH, lab	Alkalinity	Residue,Tot	Residue,Tot Vol	Residue,Tot Fix	Residue,Tot Filt	Residue,Tot Nonfilt	Residue, Vol Nonfilt	Residue, Fix Nonfilt	Nitrogen,Tot	Ammor
				FTU	umhos/cm	mg/l	su	mg/l as $CaCO_3$	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l as N	mg/l a
Collection Date Time	Temp C	Do Probe	Field Ph														
07/18/2000 12:00	23.8	16	9	2.19	471	3	7.39	165	286	74	212	251	3 U	3 U	3 U		0.12
08/09/2000 12:30	25.5	13.5	8.7	4.74	507	2 U	6.79	189	299	73	226	294	3 U	3 U	3 U		0.04
09/19/2000 11:30	19	8.7	8.7	51	196	2	6.04	60.3	142	34	108	118	38	6	32		0.08
10/11/2000 12:30	18.7	12.5	8.2	4.7	492	2 U	6.3	173	269	43	226	278	5	3	3 U		0.04
11/09/2000 11:30	15.4	11.4	8.8	2.9	470	2 U	6.42	168	290	43	247	235	3 U	3 U	3 U		0.04
12/13/2000 12:30	10.6	13.3	8.7	4.5	480	2 U	6.43	171	274	58	216	269	8	3 U	7		0.04
01/18/2001 11:00	9	11.9	8.4	10.3	459	2 U	6.39	166	271	27	244	267	3 U	3 U	3 U		0.04
02/15/2001 10:30	12.7	12.9	8.5	4.46	505	2 U	6.25	182	306	68	238	279	3 U	3 U	3 U		0.04
03/19/2001 12:00	13.8	15.7	8.9	2.02	500	2 U	6.68	171	304	89	215	285	3 U	3 U	3 U		0.04
04/02/2001 12:30	11.4	11.2	8.2	15.7	493	2 U	6.12	155	310	42	268	289	8	3 U	6		0.04
05/01/2001 11:30	19.7	14.9	9.1	2.11	476	2 U	7.08	177	314	68	246	282	3	3 U	3 U		0.04
06/04/2001 13:30	19.2	14.1	8.7	1.73	531	2	6.57	185	363	134	229	352	3	3	3 U		0.04
08/08/2001 11:00	22.7			1.7	605				398	95	303		3 U	3 U	3 U		0.04
10/25/2001 09:30	15.2	9.76	8.28	1.39	512				325	101	224		3 U	3 U	3 U		0.04
12/10/2001 12:00	13	10.1	8.5	1.9	484				301	85	216		3	3 U	3 U		0.05
02/06/2002 10:00	7.5	10.3	8.4	2.1	517				305	44	261		3 U	3 U	3 U		0.04
04/24/2002 09:40	14.59	10.29	7.96	1.4	560				309	92	217		3 U	3 U	3 U		0.05
06/04/2002 09:40	21.36	9.78	7.92	1.4	597				368	74	294		3 U	3 U	3 U		0.04
08/06/2002 10:05	23.62	12.21	8.42	0.8	617				371	57	314		3 U	3 U	3 U		0.04
10/16/2002 10:00	13.7	9.05	7.25	198	122				207	35	172		163	24	138		0.05
12/10/2002 11:45	9.71	14.4	8.02	4.5	621				368	75	293		6	3 U	4		0.05
12/17/2002 14:45																	
01/29/2003 14:45																	
02/25/2003 14:50																	
02/27/2003 11:30	6.8	9.6	7.8		5440				3068	128	2940		17	6	11		0.37
03/31/2003 12:10																	
04/10/2003 10:00	9.3	9.9	7.6		301				218	63	155		40	10	30		0.1
04/29/2003 14:55																	
05/28/2003 15:30																	
06/09/2003 11:00	18.6	9.1	8		459				300	65	235		12	3 U	10		0.12
06/26/2003 15:00																	
07/21/2003 12:30	22.6	14.8	8.2										3 U			2.82	0.04
07/22/2003 14:45																	
08/27/2003 12:10																	
09/09/2003 12:00	19.9	10.7	8.2										3			2.62	0.04
09/22/2003 11:30																	
10/22/2003 11:00																	
11/05/2003 12:00	20.8	14.5	8.8										3 U			2.11	0.04
01/22/2004 12:30	10.8	14.2	8.4										3 U			2.34	0.04
03/17/2004 12:00	11.1	13	8.3										4			2.51	0.07
05/10/2004 12:00	22	13.4	8.4										5			2.56	0.24
07/06/2004 13:30	25.4	12.6	8.35										3			2.52	0.04
09/13/2004 13:00	20.8	9.9	8.2										3 U			2.62	0.06
11/17/2004 12:30	15.3	11.5	8.1										4			2.24	0.06
01/05/2005 13:30	14.7	11	8.2										3 U			2.53	0.15
03/22/2005 13:00	13.7	13.5	8.2										12			2.26	0.12
05/04/2005 12:30	18	11.9	8.5										28			2.07	0.04
07/13/2005 12:00	21.3	12.7	8.5										3 U				.040
09/19/2005 11:00	19	11.1	8.4										7			2.00	.040
11/28/2005 11:00	11.4	9.9	7.7										4			2.12	.060
01/10/2006 12:30	11.6	10.8	8.4										3 U			2.09	.150
03/08/2006 11:00	11.8	13.8	8.4										4			1.78	.040
05/04/2006 10:00	19	15.2	7.9										3			3.06	.450
07/17/2006 11:30	24.6	12.7	8.4										3 U			3.17	.040
09/12/2006 10:30	17.8	12	8.1										5			2.49	.040
11/07/2006 13:30	11.5	8.7	8.1										10			2.06	.140
01/04/2007 16:00	12	11.2	7.8										3 U			2.66	.060
03/13/2007 15:30	18.5	16.5	8.1										3 U			2.47	.040
05/09/2007 11:30	17.9	14.3	7.8										3 U			2.31	.040
07/10/2007 11:00	22.3	16.3	8.1										3			1.82	.040
09/11/2007 12:30	20.8	13.7	8										3 U			2.06	.040
11/01/2007 11:00	14.7	9.3	6.8										26			2.55	.040
01/16/2008 12:00	9.2	15	6.5													2.66	
03/05/2008 11:00	11.9	11.2	7.6													1.85	
05/01/2008 10:30	20.1	11	7.4													2.53	
07/07/2008 16:00	21.2	10.2	8.3													1.92	
09/08/2008 15:45	25.5	13.9	8.8													1.96	
11/06/2008 11:00	18	15.3	8.7													2.19	

Station ID 4ALCK000.38	l0	00615	00620		00625	00630	00665	00900	00940	00945	31615	31616	31648	31649	32210	32211	32212	32214	32218	32219
	ıia-N	Nitrite-N	NITRATE NI		TKN	NO2+NO3	Phosphorus	Hardness	Chloride	Sulfate	Fecal Col	Fecal Col	E. Coli	Enterococci	Chlorophyll-A	Chlorophyll-A	Chlorophyll-B	Chlorophyll-C	Pheophytin-A	Pheophytin
	ıs N	mg/l as N	Value		mg/l as N	mg/l as N	mg/l as P	mg/l as $CaCO_3$	mg/l	mg/l as SO_4	MPN	n/100ml	n/100ml	n/100ml	ug/l	ug/l	ug/l	ug/l	ug/l	Ratio
Collection Date Time															(Tri Unc.)	(Spec Acid)	(Tri Unc.)	(Tri Unc.)	(Spec Acid)	Bef/Aft Acid
07/18/2000 12:00		0.01	1.17		0.4		0.07	195	29.8	33		4100								
08/09/2000 12:30	U	0.02	1.78		0.2		0.05	198	35	34.3		200								
09/19/2000 11:30		0.03	0.75		0.5		0.16	74.2	10.7	14.5		5700								
10/11/2000 12:30	U	0.02	1.78		0.3		0.08	206	28.6	29.6		100 U								
11/09/2000 11:30	U	0.02	1.67		0.3		0.07	167	27	29.6		500								
12/13/2000 12:30	U	0.01	1.67		0.5		0.14	200	26.3	31.8		2800								
01/18/2001 11:00	U	0.02	1.46		0.2		0.09	200	25.8	29.8		400								
02/15/2001 10:30		0.04	1.79		0.4		0.09	195	28.5	31.7		5100								
03/19/2001 12:00	U	0.02	1.55		0.4		0.08	217	31.6	33.6		100 U								
04/02/2001 12:30	U	0.01	1.98		0.7		0.08	187	35.9	33.3		600								
05/01/2001 11:30	U	0.04	1.75		0.3		0.06	204	30	32.1		100								
06/04/2001 13:30	U	0.02	2.02		0.4		0.05	216	36.9	39.1		600								
08/08/2001 11:00	U	0.02	2.2		0.4		0.08	244				2900								
10/25/2001 09:30	U	0.02	1.63		0.1		0.08	224				900			1.752	1.26	0.5 U	0.5 U	0.69	1.452
12/10/2001 12:00		0.02	1.87		0.3		0.04	202				200			0.609	0.64	0.5 U	0.5 U	0.5 U	
02/06/2002 10:00		0.01	1.88		0.2		0.08	200				100			0.6	0.84	0.5 U	0.5 U	0.5 U	2.469
04/24/2002 09:40		0.01	1.9		0.2		0.09	219				300			0.511	0.5 U	0.5 U	0.5 U	0.5 U	1.391
06/04/2002 09:40	U	0.01	2.04		0.2		0.14	221				300			0.515	0.71	0.5 U	0.5 U	0.5 U	2.538
08/06/2002 10:05	U	0.01	1.01		0.2		0.1	226			3500		600	510	4.258	3.42	0.5 U	0.5 U	1.18	1.52
10/16/2002 10:00		0.02	0.39		0.4		0.13	12			9200		750	800 L	9.768	5.55	0.9	0.5 U	6.68	1.318
12/10/2002 11:45		0.02	2.25		0.4		0.05	229			1100		170	60	3.413	3.28	0.5 U	1.23	0.5 U	
12/17/2002 14:45												420	330							
01/29/2003 14:45												6400	3000							
02/25/2003 14:50												2800	320							
02/27/2003 11:30		0.02	2.37		0.8		0.09	294			1100		800 L	800 L						
03/31/2003 12:10												430	80							
04/10/2003 10:00		0.02	1.18		0.5		0.08	103			16000		800 L	800 L						
04/29/2003 14:55												500	68							
05/28/2003 15:30												4400	470							
06/09/2003 11:00		0.07	2.02		0.6		0.07	155			1300		800 L	800 L						
06/26/2003 15:00												680	110							
07/21/2003 12:30	U					2.69	0.05				9200		180	600						
07/22/2003 14:45												250	46							
08/27/2003 12:10												5400	280							
09/09/2003 12:00	U					2.3	0.06				1700		170	620						
09/22/2003 11:30												3200	720							
10/22/2003 11:00												310	150							
11/05/2003 12:00	U					1.94	0.07				330		100	150						
01/22/2004 12:30	U					1.75	0.07						25 U							
03/17/2004 12:00						2.07	0.08						350							
05/10/2004 12:00						2.05	0.13						2000 L							
07/06/2004 13:30						1.98	0.07						200							
09/13/2004 13:00						2.4	0.08					720	400							
11/17/2004 12:30						1.97	0.09					120	100							
01/05/2005 13:30						2.02	0.1					50	25							
03/22/2005 13:00						1.83	0.14					120	25 U							
05/04/2005 12:30	U					1.91	0.14					50	100							
07/13/2005 12:00	U					2.11	0.07					350	120							
09/19/2005 11:00	U					1.69	0.12					700	420							
11/28/2005 11:00						1.85	0.10					980	920							
01/10/2006 12:30						1.67	0.13					25 U	25 U							
03/08/2006 11:00						1.53	0.14					25 U	25 U							
05/04/2006 10:00						1.97	0.16					11000	2000 L							
07/17/2006 11:30	U					2.46	0.05					320	120							
09/12/2006 10:30	U					2.48	0.05					650	520							
11/07/2006 13:30						1.45	0.12					5800	2000 L							
01/04/2007 16:00						2.41	0.03					380	150							
03/13/2007 15:30	U					2.27	0.06					25 U	25 U							
05/09/2007 11:30	U					2.07	0.06					300	220							
07/10/2007 11:00	U					1.76	0.04					380	350							
09/11/2007 12:30	U					1.86	0.05					1200	150							
11/01/2007 11:00						2.50	0.12					1600	1200							
01/16/2008 12:00							0.09						1000							
03/05/2008 11:00							0.06						25 U							
05/01/2008 10:30							0.06						180							
07/07/2008 16:00							0.06						2000 L							
09/08/2008 15:45							0.05						220							
11/06/2008 11:00							0.10						320							

Station ID 4ALCK000.38	70507	82079	ISLTE	PALVE	PAMAN	PAPET	PAWLD	PCLVE	PCMAN	PCPET	PCWLD
	Phosphorus,Tot Ortho	Turbidity	# of Isolates	Pres/Abs of	Pres/Abs of	Pres/Abs of	Pres/Abs of	Proport by	Proport by	Proport by	Proport by
	mg/l as P	NTU		Livestock Iso	Human Iso	Pet Iso	Wildlife Iso	Livestock %	Human %	Pet %	Wildlife %
Collection Date Time											
07/18/2000 12:00	0.05										
08/09/2000 12:30	0.04										
09/19/2000 11:30	0.12										
10/11/2000 12:30	0.07										
11/09/2000 11:30	0.06										
12/13/2000 12:30	0.06										
01/18/2001 11:00	0.06										
02/15/2001 10:30	0.07										
03/19/2001 12:00	0.06										
04/02/2001 12:30	0.05										
05/01/2001 11:30	0.04										
06/04/2001 13:30	0.03										
08/08/2001 11:00	0.02										
10/25/2001 09:30	0.06										
12/10/2001 12:00	0.07										
02/06/2002 10:00	0.08										
04/24/2002 09:40	0.07										
06/04/2002 09:40	0.09										
08/06/2002 10:05	0.08										
10/16/2002 10:00	0.04										
12/10/2002 11:45	0.03										
12/17/2002 14:45			24	1	0	1	1	38	4	25	33
01/29/2003 14:45			24	1	1	1	1	33	13	37	17
02/25/2003 14:50			23	1	1	1	1	17	35	26	22
02/27/2003 11:30	0.05	18									
03/31/2003 12:10			24	1	0	0	0	96	0	0	4
04/10/2003 10:00	0.04 Q	32									
04/29/2003 14:55			24	1	0	0	1	63	0	8	29
05/28/2003 15:30			24	1	1	1	1	21	29	17	33
06/09/2003 11:00	0.03	16									
06/26/2003 15:00			24	1	1	0	1	13	21	8	58
07/21/2003 12:30		1.4									
07/22/2003 14:45			24	1	0	1	1	17	4	21	58
08/27/2003 12:10			24	0	0	0	1	0	0	8	92
09/09/2003 12:00		2.8									
09/22/2003 11:30			24					25	0	33	42
10/22/2003 11:00			20						20	15	45
11/05/2003 12:00		3.3									
01/22/2004 12:30		1.3									
03/17/2004 12:00		3									
05/10/2004 12:00		2.3									
07/06/2004 13:30		2.3									
09/13/2004 13:00		2.9									
11/17/2004 12:30		2.6									
01/05/2005 13:30		2.1									
03/22/2005 13:00		5									
05/04/2005 12:30		5.1									
07/13/2005 12:00		3.8									
09/19/2005 11:00		2.0									
11/28/2005 11:00		5.8									
01/10/2006 12:30		1.1									
03/08/2006 11:00		1.0									
05/04/2006 10:00		4.8									
07/17/2006 11:30		1.6									
09/12/2006 10:30		1.7									
11/07/2006 13:30		18.5									
01/04/2007 16:00		1.4									
03/13/2007 15:30		1.5									
05/09/2007 11:30		1.4									
07/10/2007 11:00		2.9									
09/11/2007 12:30		1.6									
11/01/2007 11:00		9.7									
01/16/2008 12:00											
03/05/2008 11:00											
05/01/2008 10:30											
07/07/2008 16:00											
09/08/2008 15:45											
11/06/2008 11:00											

Station ID 4ALCK002.17				00076 Turbidity FTU	00095 Sp Cond umhos/cm	00500 Residue,Tot mg/l	00505 Residue, Tot Vol mg/l	00510 Residue, Tot Fix mg/l	00530 Residue, Tot Nonfilt mg/l	00535 Residue, Vol Nonfilt mg/l
Collection Date Time	Temp C	Do Probe	Field Ph							
08/06/2002 11:15	23.23	10.83	8.2	1.7	427	261	60	201	9	3
10/16/2002 10:55	13.3	9.47	7.82	88.4	99	116	19	97	80	11
12/10/2002 11:30	5.99	14.45	7.94	2.3	570	337	88	249	3 U	3 U
02/27/2003 14:00	4.4	10.4	7.9		1560	864	76	788	7	3
04/10/2003 11:00	8.8	10.1	8		232	166	45	121	35	5
06/09/2003 13:30	18	8.9	8.1		480	314	69	245	10	3
07/21/2003 13:00	19.6	9.5	8.2						5	
09/09/2003 12:15	17.6	8.7	8						3	
11/05/2003 12:30	20.5	10.4	8.3						25	
01/22/2004 13:00	10	13.6	8.4						3 U	
03/17/2004 12:30	10.4	12.1	8.2						3 U	
05/10/2004 12:30	19.9	10.5	8.2						11	
07/06/2004 14:00	22.9	9.5	8.1						3 U	
09/13/2004 13:30	18.8	9.3	8.2						6	
11/17/2004 13:00	13.1	12	8.2						3 U	
01/05/2005 14:00	14.5	11	8.35						3 U	
03/22/2005 13:30	12.9	11	8.3						4	
05/04/2005 13:00	15.9	10.1	8.3						4	

Station ID 4ALCK002.17	00540 Residue, Fix Nonfilt mg/l	00600 Nitrogen,Tot mg/l as N	00610 Ammonia-N mg/l as N	00615 Nitrite-N mg/l as N	00620 Nitrate-N mg/l as N	00625 TKN mg/l as N	00630 NO2+NO3 mg/l as N	00665 Phosphorus mg/l as P	00900 Hardness mg/l as CaCO3	31615 Fecal Col MPN	31616 Fecal Col n/100ml
Collection Date Time											
08/06/2002 11:15	6		0.04 U	0.01	0.93	0.3		0.04	204	790	
10/16/2002 10:55	69		0.04	0.02	0.24	0.2		0.1	73.7	9200	
12/10/2002 11:30	3 U		0.12	0.02	1.51	0.4		0.01	225	1300	
02/27/2003 14:00	4		0.29	0.02	1.82	0.8		0.02	229	3500	
04/10/2003 11:00	30		0.08	0.02	0.7	0.3		0.04	73.6	16000	
06/09/2003 13:30	7		0.34	0.06	1.33	0.9		0.04	189	1300	
07/21/2003 13:00		2.32	0.19				2.04	0.02		3500	
09/09/2003 12:15		2.28	0.12				1.87	0.02		230	
11/05/2003 12:30		1.79	0.04				1.56	0.04		45	
01/22/2004 13:00		1.97	0.04 U				1.73	0.02			
03/17/2004 12:30		2	0.11				1.64	0.02			
05/10/2004 12:30		2.03	0.08				1.65	0.03			
07/06/2004 14:00		2.02	0.05				1.62	0.03			
09/13/2004 13:30		1.84	0.09				1.72	0.04			13000
11/17/2004 13:00		1.9	0.12				1.64	0.03			620
01/05/2005 14:00		2.15	0.09				1.67	0.02			320
03/22/2005 13:30		2.02	0.15				1.65	0.02			50
05/04/2005 13:00		1.9	0.13				1.72	0.02			180

Station ID 4ALCK002.17	31648	31649	32210	32211	32212	32214	32218	32219	70507	82079
	E. Coli	Enterococci	Chlorophyll-A	Chlorophyll-A	Chlorophyll-B	Chlorophyll-C	Pheophytin-A	Pheophytin	Phosphorus,Tot Ortho	Turbidity
	n/100ml	n/100ml	ug/l	ug/l	ug/l	ug/l	ug/l	Ratio	mg/l as P	NTU
Collection Date Time			(Tri Unc.)	(Spec Acid)	(Tri Unc.)	(Tri Unc.)	(Spec Acid)	Bef/Aft Acid		
08/06/2002 11:15	230	240							0.02	
10/16/2002 10:55	800 L	800 L	4.096	2.42	0.5 U	0.5 U	2.64	1.335	0.05	
12/10/2002 11:30	420	90	1.823	2.01	0.5 U	0.5 U	0.5 U		0.02 U	
02/27/2003 14:00	800 L	420							0.02	10
04/10/2003 11:00	800 L	800 L							0.02 Q	33
06/09/2003 13:30	800 L	800 L							0.02	15
07/21/2003 13:00	200	160								2
09/09/2003 12:15	130	380								3.5
11/05/2003 12:30	50	190								5.1
01/22/2004 13:00	25 U									2
03/17/2004 12:30	120									3.2
05/10/2004 12:30	1200									3.2
07/06/2004 14:00	250									2
09/13/2004 13:30	2000 L									6.8
11/17/2004 13:00	220									1.8
01/05/2005 14:00	250									2.2
03/22/2005 13:30	25 U									2.5
05/04/2005 13:00	75									2.4

Station ID 4AROA202.20

Collection Date Time	Temp Celcius	Do Probe	Field Ph	RESIDUE, TOTAL (MG/L)	RESIDUE, TOTAL NONFILTRABLE (MG/L)	RESIDUE, VOLATILE NONFILTRABLE (MG/L)
1/26/2005 13:00	3.92		8.24	195	3 U	
3/14/2005 15:20	9.43	11.18	8.01	172	3 U	
5/24/2005 16:15	17.5	8.4	8.2	205	3	
7/13/2005 12:30	24.9	8	8.3		11	
9/19/2005 11:30	21.4	7.6	8.4		4	
10/13/2005 14:00	19.6	8.6	8.1		11	3 U
11/28/2005 11:30	6.5	11	7.8		3 U	
1/10/2006 12:00	8.7	11.7	8.5		4	
3/8/2006 11:30	9.7	12.7	8.4		3 U	
5/4/2006 11:00	17.3	9.3	8		6	
7/17/2006 12:00	26	8.9	8.5		7	
9/12/2006 10:00	19.3	8.9	8		3	
11/7/2006 13:00	8.5	9.7	8.1		3 U	
1/4/2007 15:30	7.5	12.2	7.9	145	3	
3/13/2007 15:00	13.5	12	8	203	3 U	
5/9/2007 11:00	17.2	11	7.7	191	3	
7/10/2007 10:30	26	8.3	7.2	251	12	
9/11/2007 12:00	25	7.8	7.7	278	6	
11/1/2007 10:30	12.3	9	6.5	272	5	
1/16/2008 11:00	4.4	14.2	6.6	243	3 U	
3/3/2008 12:15	10.7	12.5	8		3 U	3 U
3/5/2008 10:30	11.3	10	7.5			
3/5/2008 10:31						
4/7/2008 13:15	10.8	12.1	7.9		39	8
5/1/2008 11:00	14.1	10.6	8	153	14	
7/7/2008 15:30	24.3	8.1	8.2	246	12	
9/8/2008 15:30	27	8.3	8.4	215	5	
11/6/2008 10:30	11	15	8.4	271	3 U	
2/10/2009 10:30	8.4	13.2	8.5	229	5	
4/6/2009 10:00	13.2	9.4	7.1	144	8	
6/16/2009 14:00	20	7.9	8.2	233	77	
8/13/2009 11:00	24.9	8.6	8.1	236	13	
10/14/2009 9:30	13.1		8.1	259	3	
12/15/2009 10:30	10.3		7.6	156	18	
2/18/2010 10:30	5		8	209	3	
4/15/2010 11:30	14.3		8.1	190	3	
6/10/2010 11:00	22.5		8.1	247	11	
08/31/2010 11:00	24.5		8.2	265	12	
10/13/2010 10:00	17.8		8	265	2 QQ	
12/21/2010 11:30	2.3	13.8	8	251	1 QQ	
02/09/2011 11:00	4.4			217	1 QQ	
04/06/2011 11:30	10.7		8.7	168	26	
06/15/2011 16:00	24		8.3	261	6	
08/01/2011 10:30	26.6		8.2	260	6	
10/04/2011 11:00	14.2		8.3	270	2 QQ	
12/14/2011 11:00	9		8.2	191	3	
02/09/2012 11:30	7.6		8.4	186	2 QQ	
03/07/2012 11:00	8		7.8	168	5	
05/02/2012 10:30	19		8.1	183	9	
07/05/2012 13:00	28.7		8.2	223	6	
09/24/2012 11:00	17.9		8.2	249	3	
11/06/2012 11:00	8.3		8.3	267	1 QQ	
01/07/2013 11:35	7	15.6	7.9	253	2 QQ	
03/05/2013 08:55	5.5		7.9	188	2 QQ	
05/30/2013 08:45	20.4		8.1	213	6	
07/18/2013 09:10	22.3	8.4	7.9	186	7	
09/12/2013 09:45	23.7	8.1	7.9	237	3	
11/21/2013 10:25	8.6	11.9	8	246	1 QQ	
02/24/2014 13:10	8.5		7.5	174	12	
04/24/2014 08:55	14		7.5	323	2 QQ	
06/16/2014 10:50	23.6	8.4	7.8	219	5	
08/07/2014 14:20	25.7	9	8.3	253	4	
10/29/2014 09:30	14.84		7.91	252	5	
12/03/2014 10:00	7.83		7.28	144	25	
01/26/2015 16:00	6.21		8.35	210	4	
03/12/2015 10:00	9.39		7.92	166	8	
05/21/2015 10:15	19.52		7.99	217	5	
07/07/2015 10:20	23.16	7.74	7.95			

Station ID 4AROA202.

Collection Date Time	RESIDUE, FIXED NONFILTRABLE (MG/L)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, AMMONIA, TOTAL (MG/L AS N)	KJELDAHL, TOTAL, (MG/L AS N)	NITRITE PLUS NITRATE, TOTAL 1 DET. (MG/L AS N)
1/26/2005 13:00		0.79			
3/14/2005 15:20		0.63			
5/24/2005 16:15		0.64			
7/13/2005 12:30		0.8	0.04 U		0.49
9/19/2005 11:30		0.66	0.04 U		0.42
10/13/2005 14:00	10				
11/28/2005 11:30		0.56	0.04 U		0.38
1/10/2006 12:00		0.61	0.04 U		0.39
3/8/2006 11:30		0.72	0.04 U		0.55
5/4/2006 11:00		0.69	0.04 U		0.33
7/17/2006 12:00		0.87	0.04 U		0.4
9/12/2006 10:00		0.59	0.04 U		0.45
11/7/2006 13:00		0.54	0.04 U		0.35
1/4/2007 15:30		0.63			
3/13/2007 15:00		0.79			
5/9/2007 11:00		0.5			
7/10/2007 10:30		0.69			
9/11/2007 12:00		0.74			
11/1/2007 10:30		0.87			
1/16/2008 11:00		0.51		0.3	
3/3/2008 12:15	3 U				
3/5/2008 10:30				0.4	
3/5/2008 10:31		0.67			
4/7/2008 13:15	31				
5/1/2008 11:00		0.64		0.6	
7/7/2008 15:30		0.65		0.5	
9/8/2008 15:30		0.66		0.5	
11/6/2008 10:30		0.44		0.2	
2/10/2009 10:30		0.6		0.3	
4/6/2009 10:00		0.56		0.2	
6/16/2009 14:00		0.98		0.6	
8/13/2009 11:00		0.83		0.2	
10/14/2009 9:30		0.58		0.1	
12/15/2009 10:30		0.87		0.1	
2/18/2010 10:30		0.87		0.1	
4/15/2010 11:30		0.62		0.2	
6/10/2010 11:00		0.77		0.2	
08/31/2010 11:00		0.95		0.2	
10/13/2010 10:00		0.72		0.2	
12/21/2010 11:30		0.96		0.2	
02/09/2011 11:00		0.79		0.1	
04/06/2011 11:30		0.69		0.4	
06/15/2011 16:00		0.8		0.2	
08/01/2011 10:30		0.69		0.3	
10/04/2011 11:00		0.56		0.1	
12/14/2011 11:00		1.01		0.2	
02/09/2012 11:30		0.64		0.2	
03/07/2012 11:00		0.76		0.2	
05/02/2012 10:30		0.6		0.5	
07/05/2012 13:00		0.74		0.3	
09/24/2012 11:00		0.69		0.3	
11/06/2012 11:00		0.37		0.2	
01/07/2013 11:35		0.63		0.1	
03/05/2013 08:55		0.61		0.1	
05/30/2013 08:45		0.56		0.2	
07/18/2013 09:10		0.7		0.3	
09/12/2013 09:45		0.77		1.3	
11/21/2013 10:25		0.49		0.1	
02/24/2014 13:10		0.83		0.2	
04/24/2014 08:55		0.52		0.1	
06/16/2014 10:50		0.66		0.2	
08/07/2014 14:20		0.67		0.1	
10/29/2014 09:30		0.64		0.1	
12/03/2014 10:00		0.75		0.4	
01/26/2015 16:00		0.62		0.2	
03/12/2015 10:00		1.14		0.1	
05/21/2015 10:15		0.69		0.2	
07/07/2015 10:20					

Station ID 4AROA202.

Collection Date Time	PHOSPHORUS, TOTAL (MG/L AS P)	CARBON, TOTAL ORGANIC (MG/L AS C)	CARBON, DISSOLVED ORGANIC (MG/L AS C)	FECAL COLIFORM,MEMBR FILTER,M-FC BROTH,44.5 C	E. COLI - MTEC-MF N0/100ML
1/26/2005 13:00	0.01			120	75
3/14/2005 15:20	0.01			50	25 U
5/24/2005 16:15	0.02			220	280
7/13/2005 12:30	0.04			180	120
9/19/2005 11:30	0.03			150	200
10/13/2005 14:00		2 U			
11/28/2005 11:30	0.01 U			75	50
1/10/2006 12:00	0.01			25 U	25 U
3/8/2006 11:30	0.01			25 U	25 U
5/4/2006 11:00	0.03			180	120
7/17/2006 12:00	0.02			300	25
9/12/2006 10:00	0.01			300	320
11/7/2006 13:00	0.01			50	50
1/4/2007 15:30	0.01			25 U	25
3/13/2007 15:00	0.02			25 U	25 U
5/9/2007 11:00	0.01			50	75
7/10/2007 10:30	0.04			25	50
9/11/2007 12:00	0.04			120	25 U
11/1/2007 10:30	0.03			50	75
1/16/2008 11:00	0.02			25 U	25 U
3/3/2008 12:15		2 U	2 U		
3/5/2008 10:30	0.03			500	300
3/5/2008 10:31					
4/7/2008 13:15		4.7	3.91		
5/1/2008 11:00	0.03			120	120
7/7/2008 15:30	0.03			50	120
9/8/2008 15:30	0.03			400	75
11/6/2008 10:30	0.01			25 U	25 U
2/10/2009 10:30	0.01			25 U	25
4/6/2009 10:00	0.02			50	50
6/16/2009 14:00	0.12			2000 L	1400
8/13/2009 11:00	0.05			150	120
10/14/2009 9:30	0.03			50	100
12/15/2009 10:30	0.04			180	100
2/18/2010 10:30	0.01			25 U	25 U
4/15/2010 11:30	0.02			50	25 U
6/10/2010 11:00	0.02			180	180
08/31/2010 11:00	0.03			520	75
10/13/2010 10:00	0.02			150	25
12/21/2010 11:30	0.01			25	25
02/09/2011 11:00	0.002 U				
04/06/2011 11:30	0.05			500	400
06/15/2011 16:00	0.03			250	75
08/01/2011 10:30	0.02			750	150
10/04/2011 11:00	0.02				
12/14/2011 11:00	0.02			100	50
02/09/2012 11:30	0.01			25 U	25 U
03/07/2012 11:00	0.02			50	25 U
05/02/2012 10:30	0.03			100	125
07/05/2012 13:00	0.03			50	75
09/24/2012 11:00	0.02			125	25
11/06/2012 11:00	0.01			25 U	25 U
01/07/2013 11:35	0.01			25 U	25 U
03/05/2013 08:55	0.01			25 Q	25 U
05/30/2013 08:45	0.02			275 Q	75
07/18/2013 09:10	0.03			450	175
09/12/2013 09:45	0.02			300	100
11/21/2013 10:25	0.01			125	75
02/24/2014 13:10	0.02			25	25 U
04/24/2014 08:55	0.01			225 Q	175
06/16/2014 10:50	0.02			400	125
08/07/2014 14:20	0.02			75	25
10/29/2014 09:30	0.01			25	
12/03/2014 10:00	0.06			425	
01/26/2015 16:00	0.02			25 U	
03/12/2015 10:00	0.02			25 U	
05/21/2015 10:15	0.02			125	
07/07/2015 10:20				1800 BQ	

Station ID 4AROA202.

Collection Date Time	E.COLI BY COLILERT SM 9223-B		TURBIDITY,LAB NEPHELOMETRIC TURBIDITY UNITS, NTU	HARDNESS, TOTAL mg/l as CaCO3
1/26/2005 13:00			3	
3/14/2005 15:20			2.4	
5/24/2005 16:15			3.5	
7/13/2005 12:30			11	
9/19/2005 11:30			4.5	
10/13/2005 14:00				
11/28/2005 11:30			4.2	
1/10/2006 12:00			1.56	
3/8/2006 11:30			2.26	
5/4/2006 11:00			3.52	
7/17/2006 12:00			0.67	
9/12/2006 10:00			2.02	
11/7/2006 13:00			2.1	
1/4/2007 15:30			3	
3/13/2007 15:00			1.6	
5/9/2007 11:00			6.3	
7/10/2007 10:30			11.5	
9/11/2007 12:00			5.3	
11/1/2007 10:30			3.7	
1/16/2008 11:00			0.9	
3/3/2008 12:15				
3/5/2008 10:30				
3/5/2008 10:31				
4/7/2008 13:15				
5/1/2008 11:00			3.7	
7/7/2008 15:30			7.2	
9/8/2008 15:30			5	
11/6/2008 10:30			2.3	
2/10/2009 10:30			1.9	
4/6/2009 10:00			4.4	
6/16/2009 14:00			78.6	
8/13/2009 11:00			5.3	
10/14/2009 9:30			1.9	
12/15/2009 10:30			12.1	
2/18/2010 10:30			1.22	
4/15/2010 11:30			1.55	
6/10/2010 11:00			2.78	
08/31/2010 11:00			3.89	
10/13/2010 10:00			1.48	
12/21/2010 11:30			0.74	
02/09/2011 11:00			0.96	
04/06/2011 11:30			16	
06/15/2011 16:00			3.85	
08/01/2011 10:30			3.63	
10/04/2011 11:00			1.99	
12/14/2011 11:00			2.47	
02/09/2012 11:30			0.82	
03/07/2012 11:00			3.73	
05/02/2012 10:30			5.43	
07/05/2012 13:00			3.7	
09/24/2012 11:00			2.73	
11/06/2012 11:00			1.72	
01/07/2013 11:35			3.97	
03/05/2013 08:55			0.9	
05/30/2013 08:45			2.42	
07/18/2013 09:10			6.46	
09/12/2013 09:45			2.25	
11/21/2013 10:25			0.52	
02/24/2014 13:10			9.41	
04/24/2014 08:55			1.36	
06/16/2014 10:50			3.14	
08/07/2014 14:20			3.05	
10/29/2014 09:30	31		2.72	
12/03/2014 10:00	473		22.1	
01/26/2015 16:00	10	U	2.65	146
03/12/2015 10:00	75		6.6	144
05/21/2015 10:15	187		2.21	179
07/07/2015 10:20	573			

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Cause Group Code: **L05R-04-BAC** **Lick Run**

Location: The upper limit is near Shaffers Crossing rail yard and headwaters from along I-581 on downstream to the mouth of Lick Run on Tinker Creek at river mile 1.41. The 1996, 1998 and 2002 impaired waters have expanded by 5.01 miles with the 2004 Listing (Roanoke Quad).

City / County: Roanoke City Roanoke Co.

Use(s): Recreation

Cause(s) /
VA Category: Escherichia coli/ 4A

Originally 303(d) Listed in 2002 for fecal coliform (FC) bacteria. The Tinker Creek Bacteria Total Maximum Daily Load (TMDL) is U.S. EPA approved 8/05/2004 [Fed ID 24540] and SWCB approved 12/02/2004. The bacteria impairment remains for these 9.36 mile waters.

4ALCK002.17- (Washington Park) There are no additional data beyond the 2008 IR. One of three remaining E.coli samples exceeds the instantaneous criterion at 250 cfu/100 ml in 2012. Seven of 15 Escherichia coli (E.coli) samples exceed the 235 cfu/100 ml instantaneous criterion within the 2010 data window. Excessive values range from 250 to greater than 2000 cfu/100 ml. The 2008 data window reports E.coli samples exceed the WQS instantaneous criterion in nine of 18 samples. Exceeding values range from 250 to greater than 2000 cfu/100 ml. The 2006 Integrated Report (IR) reveals eight of 15 E.coli samples exceed the 235 cfu/100 ml instantaneous criterion with the same range of exceedance.

4ALCK000.38 (Norfolk Southern parking lot bridge) The 2002 original listing station found exceedances of the former FC instantaneous and geomean criteria in a Special Study conducted in 1997. E.coli excursions of the 235 cfu/100 ml instantaneous criterion within the 2010 data window are 21 of 46 E.coli samples with exceedances ranging from 280 to 3000 cfu/100 ml. There are no additional data beyond the 2010 IR. The 2012 assessment finds 10 of 24 remaining samples in excess of the instantaneous criterion. The range of exceeding values is 350 to greater than 2000 cfu/100 ml. The 2008 IR finds 19 of 38 E.coli samples in excess of the instantaneous criterion with exceedances ranging from 280 to 3000 cfu/100 ml. 2006 E.coli excursions of the instantaneous criterion are found in 13 of 25 samples with the same exceedance range as in 2008.

Assessment Unit / Water Name / Description	Cause Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L05R_LCK01A00 / Lick Run / Lick Run mainstem from near Shaffer's Crossing downstream to Lick Run mouth on Tinker Creek.	4A Escherichia coli		2004	8/5/2004	9.37

Lick Run **DCR Watershed: L05*** **Recreation**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:			**9.37**

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Sources:

Discharges from Municipal Separate Storm Sewer Systems (MS4)	Municipal (Urbanized High Density Area)	Sanitary Sewer Overflows (Collection System Failures)	Unspecified Domestic Waste
Wastes from Pets	Wildlife Other than Waterfowl		

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Cause Group Code: **L05R-01-BAC** **Tinker Creek**

Location: Tinker Creek mainstem from its headwaters downstream to the Tinker Creek confluence with the Roanoke River.

City / County: Botetourt Co. Roanoke City Roanoke Co.

Use(s): Recreation

Cause(s) /
VA Category: Escherichia coli/ 4A

Originally 303(d) Listed in 1998 for fecal coliform (FC) bacteria the Tinker Creek Bacteria Total Maximum Daily Load (TMDL) is U.S. EPA approved 8/05/2004 [Fed IDs: 7787 (FC), 21671 and 21672] and SWCB approved 12/02/2004. The 19.33 mile bacteria impairment remains.

4ATKR015.88 (Off Rt. 779 at USGS Gage) There are no additional data beyond the 2010 IR. The 2012 assessment finds six of 15 remaining Escherichia coli (E.coli) observations exceed the 235 cfu/100 ml instantaneous criterion ranging from 320 cfu/100 ml to greater than 2000. E.coli exceed the instantaneous criterion in 22 of 37 samples within the 2010 data window. Exceeding values range from 270 to 2300 cfu/100 ml. 2008 collections find E.coli in excess of the instantaneous criterion in 18 of 30 samples with the same range of exceedance as 2010. The 2006 Integrated Report (IR) exceedance range is the same from 17 of 25 samples.

4ATKR009.30 (Rt. 11 Bridge near Hollins) There are no additional data beyond the 2008 assessment. One of three remaining E.coli observations exceeds the instantaneous criterion of 235 cfu/100 ml at 250 within the 2012 data window. 2010 data find E. coli exceeds the 235 cfu/100 ml instantaneous criterion in nine of 15 samples with the same range of exceedance as in 2008. 2008 samples reveal 10 excursions of the instantaneous criterion from 18 samples. Exceedances range from 420 to 1100 cfu/100 ml. 2006 IR reports nine of 15 E. coli excursions of the instantaneous criterion and the same range of exceedance as 2008.

4ATKR000.69 (Rt. 24 Bridge, Vinton) The 2012 data window finds Escherichia coli (E.coli) exceed the instantaneous criterion of 235 cfu/100 ml in 16 of 35 observations ranging from 280 cfu/100 ml to 1200. 2010 E.coli samples exceed the instantaneous criterion of 235 cfu/100 ml in 31 of 49 observations. The range of exceeding values is from 250 cfu/100 ml to greater than 2000. The 2008 assessment finds E.coli exceedances occur in 29 of 44 observations with the same range of exceedance as 2010. The 2006 Integrated Report (IR) found E.coli exceeding the instantaneous criterion in 20 of 30 observations. Exceeding values range from 300 cfu/100 ml to greater than 2000.

Assessment Unit / Water Name / Description	Cause Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L05R_TKR01A00 / Tinker Creek / Tinker Creek mainstem from the its confluence with the Roanoke River upstream to the mouth of Carvin Creek.	4A Escherichia coli		2006	8/5/2004	5.33
VAW-L05R_TKR01B06 / Tinker Creek / Tinker Creek mainstem from the Carvin Creek mouth upstream to the confluence of Buffalo Creek.	4A Escherichia coli		2006	8/5/2004	6.54
VAW-L05R_TKR02A00 / Tinker Creek / Tinker Creek mainstem from the mouth of Buffalo Creek upstream to the Roanoke City diversion tunnel located just upstream of the USGS stream gaging station.	4A Escherichia coli		2006	8/5/2004	4.34
VAW-L05R_TKR03A00 / Tinker Creek / Tinker Creek mainstem from the Roanoke City diversion tunnel to Carvin Cove on upstream to its headwaters.	4A Escherichia coli		2006	8/5/2004	3.12

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Tinker Creek

DCR Watershed: L05*

Recreation

	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:			**19.33**

Sources:

Discharges from Municipal Separate Storm Sewer Systems (MS4)	Livestock (Grazing or Feeding Operations)	Municipal (Urbanized High Density Area)	Sanitary Sewer Overflows (Collection System Failures)
Unspecified Domestic Waste	Wastes from Pets	Wildlife Other than Waterfowl	

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Cause Group Code: **L05R-01-BEN** **Tinker Creek**

Location: Tinker Creek mainstem from the its confluence with the Roanoke River upstream to the mouth of Carvin Creek.

City / County: Botetourt Co. Roanoke City Roanoke Co.

Use(s): Aquatic Life

Cause(s) / VA Category: Benthic-Macroinvertebrate Bioassessments/ 5A

The benthic community is impaired for 5.33 miles based on a 2008 Virginia Stream Condition Index survey (VSCI).

4ATKR000.69 (Rt. 24 Bridge - Vinton) One 2008 VSCI survey scoring 50.9. There have been no additional surveys within the 2012 data window. The score indicates a stressed community with low taxonomic diversity and low abundance of pollution-sensitive organisms. A visual assessment indicates that more than 70% of the stream substrate was covered with a thick mat of algae which may limit habitat available for macroinvertebrates that require clean substrates.

Assessment Unit / Water Name / Description	Cause	Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L05R_TKR01A00 / Tinker Creek / Tinker Creek mainstem from the its confluence with the Roanoke River upstream to the mouth of Carvin Creek.	5A	Benthic-Macroinvertebrate Bioassessments		2010	2022	5.33

Tinker Creek

DCR Watershed: L05*

	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Aquatic Life			
Benthic-Macroinvertebrate Bioassessments - Total Impaired Size by Water Type:			**5.33**

Sources:

Loss of Riparian Habitat

Municipal (Urbanized High Density Area)

Urban Runoff/Storm Sewers

Wet Weather Discharges (Non-Point Source)

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Cause Group Code: **L05R-01-TEMP** **Tinker Creek**

Location: Tinker Creek mainstem from the confluence of Buffalo Creek downstream to its confluence with the Roanoke River.

City / County: Botetourt Co. Roanoke City Roanoke Co.

Use(s): Aquatic Life

Cause(s) /
VA Category: Temperature, water/ 5C

The waters remain impaired for the Aquatic Life Use.

4ATKR009.30- (Rt. 11 Bridge - near Hollins) There are no additional temperature data beyond the 2008 IR. No exceedances are found in the remaining three measurements within the 2012 data window. 2010 data find one temperature measurement exceeding the 21°C criterion from 15 measurements. 2008 temperature data exceeds the stockable trout water criterion in three of 23 measurements at 23°C (6/04/2002); 25 °C (8/08/2001) and 21.2°C (7/06/2004). Temperature exceeds the criterion in three of 20 measurements in 2006 with the same exceeding measurements as in 2008. Temperature exceeds the 21°C criterion in two of eight measurements within the 2004 data window. Temperature exceedances are 23°C (6/04/2002) and 25 °C (8/08/2001).

4ATKR000.69- (Rt. 24 Bridge in Vinton) A 1999 Consent Decree Attachment A station. The 2012 assessment reports five of 38 measurements exceed the Class V temperature criterion (21°C). Exceedances range from 21.3 to 22.1°C. Seven of 41 measurements exceed the Class V criterion with the 2010 data window. Exceedances range from 21.3 to 22.2°C. Ten of 48 measurements exceed the 21°C criterion within the 2006 & 2008 data windows. Exceedances range from 21.1°C to 23.4°C for both assessments. The 2004 assessment reports three of 56 measurements exceed the 21°C Class V criterion although Fully Supporting from assessed data. Exceedances occur on 7/22/1999 (23°C), 6/13/2000 (22°C) and 8/08/2001 (23°C). The 2002 data window shows seven of 59 temperature measurements in excess of the criterion.

Assessment Unit / Water Name / Description	Cause	Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L05R_TKR01A00 / Tinker Creek / Tinker Creek mainstem from the its confluence with the Roanoke River upstream to the mouth of Carvin Creek.	5C	Temperature, water		2002	2014	5.33
VAW-L05R_TKR01B06 / Tinker Creek / Tinker Creek mainstem from the Carvin Creek mouth upstream to the confluence of Buffalo Creek.	5C	Temperature, water		2002	2014	6.54

Tinker Creek **DCR Watershed: L05*** **Aquatic Life**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Temperature, water - Total Impaired Size by Water Type:			**11.87**

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Sources:

Natural Conditions - Water Quality Standards Use Attainability Analyses Needed

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

Cause Group Code: **L12L-01-PCB** **Roanoke River, Tinker Creek and Peters Creek.**

Location: Roanoke River from the confluence of the North and South Forks downstream to Niagara Dam. The impairment includes Peters Creek from the Rt. 460 Bridge downstream to its confluence on the Roanoke River; and Tinker Creek from the mouth of Deer Branch downstream to the Tinker Creek confluence on the Roanoke River.

City / County: Botetourt Co. Montgomery Co. Roanoke City Roanoke Co. Salem City

Use(s): Fish Consumption Public Water Supply Wildlife

Cause(s) / VA Category: PCB in Fish Tissue/ 4A PCB in Water Column/ 4A

The waters of the Roanoke River (28.60 miles), Peters Creek (2.52 miles) and Tinker Creek (5.33 miles) are under a Virginia Department of Health (VDH) Fish Consumption Advisory for Polychlorinated Biphenols (PCB) issued 7/27/05. An additional 3.14 miles on the Roanoke from Niagara Dam to Smith Mtn. Lake are under advisory and described in Fact Sheet L12L-02-PCB. The VDH Advisory is based on fish tissue found to originally contain greater than 50 parts per billion (ppb) of PCBs. The DEQ Water Quality Standard (WQS) based tissue value (TV) criterion is 20 ppb in fish tissue. The previous advisory (issued 10/20/03) recommended that no more than two eight-ounce meals per month of flathead catfish (less than 32 inches in size), striped bass, gizzard shad, redhorse sucker, largemouth bass and carp should be consumed. Per the previous advisory, flathead catfish (greater than 32 inches in size) should not be eaten. The advisory has been updated to also recommend that no more than two eight-ounce meals per month of channel catfish should be consumed.

The Roanoke (Staunton) River PCB TMDL Study is U.S. Environmental Protection Agency (EPA) approved on 4/9/2010 and State Water Control Board (SWCB) approved 12/9/2010. A 3.14 mile portion of the Roanoke River is not included in the PCB TMDL Study. The following Federal Identification Numbers by watershed are approved:

L03R Roanoke River: 38624, 38625, 38627, 38629, 38543, 38630
L04R Roanoke River: 24537, 38552, 38632, 38633, 38634, 38635, 38636
Peters Creek: 38468
L05R Tinker Creek: 38467

Fish tissue collections from locations on the Roanoke mainstem, Blackwater River, Mason Creek, Mudlick Creek, Paint Bank Branch, Peters Creek, Tinker Creek and the North and South Forks of the Roanoke River are reviewed by the VDH in making an advisory determination. A complete listing of collection sites and associated fish tissue data are available at http://www.deq.virginia.gov/fishtissue/fishtissue.html. A more detailed presentation of the data can also be found using an interactive mapping application at http://www.deq.virginia.gov/wqa/. The VDH Advisory information is also available via the web at http://www.vdh.virginia.gov/epidemiology/DEE/PublicHealthToxicology/Advisories/index.htm.

Thirty day deployment of Semi-Permeable Membrane Devices (SPMD) or virtual fish in 2008 find exceedances of the WQS PCB water column criterion of 0.00064 micrograms per liter (µg/L) or 640 picograms per liter (pg/L). Exceedances are recorded for the Fish Consumption Use via WQS 'Other Waters' (12.09 miles) as well as the Wildlife Use (12.09 miles) and the 'Public Water Supply Use' (PWS 1.64 miles) for the human health criterion at the stations listed below. The 640 pg/L criterion applies to these Uses. The 'PCB in Water Column' impairment on the mainstem of the Roanoke River extends from the confluence of Mason Creek downstream to the mouth of Back Creek (15.23 miles). Fact Sheet L12L-02-PCB describes and the additional 3.14 miles for each of these uses. The 'PCB in Water Column' impairment overlays a total 15.23 mile portion of the overall VDH Fish Consumption Advisory area above Smith Mountain Lake.

4AROA207.08- (Near Memorial Bridge downstream of Peters Creek)- 2008 SPMD 'OE'. Exceeds PCB WQS 'Other Waters' 640 pg/L criterion from one of two deployments at 642.

4AROA204.76 (Downstream of Ore Br., near VA Scrap Iron Co. above American Visco)- Two 2008 SPMD deployments find exceedance of the WQS 'Other Waters' 640 pg/L criterion at 987 and 3,014 pg/L.

2012 Impaired Waters

Categories 4 and 5 by DCR Watershed*

Roanoke and Yadkin River Basins

Fact Sheet prepared for DCR Watershed: L05*

4AROA202.20 (13th Street Bridge - above STP)- Two 2008 SPMD deployments find exceedance of the WQS 'Other Waters' 640 pg/L criterion at 1,376 and 3,044 pg/L.

4AROA199.20 (Blue Ridge Parkway Bridge - Niagara)- Two 2008 SPMD deployments find exceedance of the WQS 'Other Waters' and 'PWS' 640 pg/L criterion at 1,213 and 1,588 pg/L.

Assessment Unit / Water Name / Description	Cause Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAW-L05R_TKR01A00 / Tinker Creek / Tinker Creek mainstem from the its confluence with the Roanoke River upstream to the mouth of Carvin Creek.	4A PCB in Fish Tissue		2006	4/9/2010	5.33

Roanoke River, Tinker Creek and Peters Creek.

DCR Watershed: L05*

	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Fish Consumption			
PCB in Fish Tissue - Total Impaired Size by Water Type:			**5.33**

Sources:

Landfills	Source Unknown	Urban Runoff/Storm Sewers	Wet Weather Discharges (Non-Point Source)

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

Table E-3: Point Sources Sediment TMDL Allocations

Facility Name	Permit Number	Annual Sediment Loads (tons/yr)	Allocated Loads (tons/yr)	Percent Reduction
Western Virginia Water Authority	VA0025020	472.2	472.2	0
Roanoke Electric Steel Corporation	VA0001589	92.9	92.9	0
Shawville Town STP	VA0024031	9.1	9.1	0
Carvin Cove Water Filtration Plant	VA0001473	17.6	17.6	0
Crystal Springs WTP	VA0091065	8.8	8.8	0
Norfolk Southern Railway Company - Shaffers Crossings	VA0001597	1.62	1.62	0
Ellison Lafayette WWTP	VA0062219	11.2	11.2	0
Blacksburg Country Club STP	VA0027481	1.57	1.57	0
Roanoke Moose Lodge	VA0077895	0.21	0.21	0
		Total Allocated Load	**615.3**	**0**

The MS4 allocations detailed in Table E-2 are broken down by MS4 Urban area and shown in Table E-4.

Table E-4: Sediment TMDL Wasteload Allocations for MS4 Urban Areas

MS4 Permit Holder	Permit Number	Sediment Allocation (Tons/Year)
Roanoke County	VAR040022	1823
City of Roanoke	VAR040004	1487
Town of Vinton	VAR040026	128
Botetourt County	VAR040023	327
City of Salem	VAR040010	589
VDOT Roanoke Urban Area	VAR040017	27
Virginia Western Community College	VAR040030	2
Virginia Medical Center	VAR040050	10
VDOT Montgomery County Urban Area	VAR040016	4
Town of Blacksburg	VAR040019	102
Town of Christianburg	VAR040025	75
	Total	**4573**

Table D-1: Stormwater TMDL Allocations for Individual Permitted Facilities

Permit Number	Facility	TSS Stormwater Allocation (tons/yr)
VA0001252	Associated Asphalt Inc.	2.78
VA0001333	Koppers Inc.	18.24
VA0001589	Roanoke Electric Steel Corp.	56.55
VA0001511	Norfolk Southern Railway Co - East End Shops	35.70
VA0001597	Norfolk Southern Railway Co. - Shaffers Crossing	28.83
VA0025020	Western Virginia Water Authority	34.17
VA0088358	Fred Whitaker Co.	0.97
VA0089991	Federal Mogul Corp.	12.30

Table D-2: TMDL Allocations for General Stormwater Permits Issued to Industrial Facilities

Permit Number	Facility	Receiving Waterbody	MS4 Area	TSS Allocation (tons/yr)
VAR050027	Auto Salvage & Sales, Inc.	Tinker Creek	Roanoke City	0.53
VAR050134	Greater Roanoke Transit Company	Lick Run	Roanoke City	0.81
VAR050135	Virginia Scrap Iron & Metal Company Inc	Roanoke River	Roanoke City	1.66
VAR050143	Virginia Scrap Iron & Metal Incorporated	Roanoke River	Roanoke City	1.66
VAR050144	North 11 Asphalt Plant - Roanoke	Carvins Creek	Roanoke City	27.43
VAR050145	Holland-Richards Vault Service	Mason Creek	Roanoke City	0.25
VAR050178	BFI Waste Systems LLC - Roanoke	Roanoke River	Roanoke City	0.63
VAR050207	1915 Plantation Rd LLC	Lick Run	Roanoke City	0.63
VAR050208	Walker Machine & Foundry Corp	Roanoke River	Roanoke City	2.40
VAR050272	Roanoke Regional Airport	Deer Creek	Roanoke City	179.22
VAR050273	Ralph Smith Inc Steel Fabrication	Roanoke River UT	Roanoke City	0.67
VAR050274	USPS Roanoke Vehicle Maintenance Service	Roanoke River	Roanoke City	3.56
VAR050275	Old Dominion Auto Salvage	Tinker Creek	Roanoke City	3.46
VAR050436	Norfolk Southern Corp - Roadway Material Yard	Roanoke River	Roanoke City	0.49
VAR050437	Estes Express Lines Incorporated	Roanoke River, UT	Roanoke City	2.33
VAR050460	Yellow Freight System Inc	Tinker Creek	Roanoke City	1.62
VAR050496	Federal Express Corp - ROAA Station	Lick Run	Roanoke City	1.69
VAR050516	Mennel Milling Company	Roanoke River	Roanoke City	0.32
VAR050519	FedEx Freight East, Inc.	UT to Lick Run	Roanoke City	1.73
VAR050520	O'Neal Steel Inc	Tinker Creek	Roanoke City	6.46
VAR050522	Progress Rail Services Corp - Roanoke	Roanoke River	Roanoke City	3.95

Stream	Point sources			Stormwater dischargers[a]			MS4s		
	Baseline (mg/yr)	WLA (mg/yr)	% Reduction[b]	Baseline (mg/yr)	WLA (mg/yr)	% Reduction[b]	Baseline (mg/yr)	WLA (mg/yr)	% Reduction[b]
Roanoke River[e]	78,305.9	1,926.7	97.5	82,724.2	5.1	100.0	0.0	0.0	0.0
Lower Total	**78,305.9**	**1,926.7**	**97.5**	**388,012.2**	**7.5**	**100.0**	**11.7**	**0.1**	**99.3**

a. Stormwater loads were assigned to streams based on the spatial orientation of the permitted area within the subbasin network
b. WLA percent reductions differ from TMDL percent reductions because they do not include an MOS load
c. 2008 303(d) segment L12L-01-PCB
d. 2008 303(d) segment L26R-01-PCB
e. 2008 303(d) segment L19R-01-PCB

Table 6-4. Point source tPCBs WLAs

Stream	NPDES ID	Facility	Pipe	Baseline (mg/yr)	WLA (mg/yr)	% Reduction[a]
Upper Roanoke River						
North Fork Roanoke River	VA0027481	Blacksburg Country Club	1	10.7	17.8	-66.3
North Fork Roanoke River Total				**10.7**	**17.8**	**-66.3**
South Fork Roanoke River	VA0062219	Montgomery County PSA - Elliston Lafayette WWTP	1	38.5	127.0	-229.6
South Fork Roanoke River	VA0024031	Montgomery County PSA - Shawsville STP	1	29.9	101.6	-239.6
South Fork Roanoke River Total				**68.4**	**228.6**	**-234.0**
Peters Creek	VA0001589	Steel Dynamics	5	90.7	50.8	44.0
Peters Creek Total[b]				**90.7**	**50.8**	**44.0**
Roanoke River	VA0025020	WVWA Roanoke Regional Water Pollution Control Plant	1	17,491.1	27,934.4	-59.7
Roanoke River	VA0001597	Norfolk Southern Railway Co - Shaffers Crossing	2	4.8	35.6	-642.0
Roanoke River Total[b]				**17,495.9**	**27,969.9**	**-59.9**
Upper Total				***17,665.8***	***28,267.1***	***-60.0***
Lower Roanoke (Staunton) River						
Roanoke River	VA0083097	Old Dominion Clover Power Station	1	197.4	319.3	-61.8
Roanoke River	VA0022241	Brookneal Town - Staunton River Lagoon	1	8.2	14.4	-74.2
Roanoke River	VA0001538	Dan River, Inc- Brookneal	1	474.8	244.1	48.6
Roanoke River	VA0083402	Old Dominion Altavista Power Station	1	22.7	21.5	5.0
Roanoke River	VA0020451	Town of Altavista-STP	1	21,311.1	662.6	96.9
Roanoke River	VA0083399	Old Dominion Pittsylvania Power Station	1	21.3	35.3	-66.0
Roanoke River	VA0001678	ITG Burlington Ind. LLC Hurt Plant	1	56,270.5	629.5	98.9
Roanoke River Total[c]				**78,305.9**	**1,926.7**	**97.5**
Lower Total				***78,305.9***	***1,926.7***	***97.5***

a. WLA percent reductions differ from TMDL percent reductions because they do not include an MOS load
b. 2008 303(d) segment L12L-01-PCB
c. 2008 303(d) segment L19R-01-PCB

Table 6-5. Permitted stormwater dischargers tPCBs WLAs[a]

Stream	NPDES ID[b]	Stormwater discharger	Baseline (mg/yr)	WLA (mg/yr)	% Reduction[c]
Upper Roanoke River					
North Fork Roanoke River	VAR050204	Wolverine Advanced Materials	12.70	0.12	99.050
North Fork Roanoke River	VAR051352	MRSWA Solid Waste Transfer Station MRF	54.91	0.52	99.050

Significant Spill and Release Summary

Date	Material Released	Released From/ Capacity In Gallons	Volume Released	Source of Release/Cause	Corrective Actions	Effective Secondary Containment	Amount to Water	Enforcement Actions	Effectiveness of Monitoring Equipment
4/18/12	Diesel	Contractor Truck	1 gallon	Ruptured tank on vehicle	Catch pan used to contain lead/ repairs by local mechanics	NA	Unknown	NA	NA
5/3/12	Diesel Fuel Additive	Diesel Tank	1 gallon	Tank overflowed	Contractor hired	NA	0	NA	NA
5/30/12	Diesel	Locomotive	100 gallons	Spilled during fueling	Release secured / contractor hired	NA	0	NA	NA
8/6/12	Motor Oil	Locomotive	10 gallons	Sump overflowed	Release secured / contractor hired	NA	0	NA	NA
9/24/12	Lubricating Oil	Locomotive	15 gallons	Unknown	Release secured / absorbents applied	NA	0	NA	NA
10/3/12	Oil Residue	Dumpster	1 gallon	Leak from dumpster	Clean up completed	NA	0	NA	NA
10/6/12	Diesel	Locomotive	15 gallons	Operator error	Clean up completed	NA	0	NA	NA
10/22/12	Diesel	Track Mobile	1 gallon	Broken fitting	Release secured / absorbents applied	NA	0	NA	NA
1/5/13	Motor Oil	Locomotive	10 ounces	Sump overflowed	Clean up completed	NA	0	NA	NA
2/21/13	Motor Oil	Locomotive	5 gallons	Sump overflowed	Release secured / contractor hired	NA	0	NA	NA
2/27/13	Diesel	Tanker Truck	1 gallons	Spill during transfer	Release secured / absorbents applied	NA	0	NA	NA
3/3/13	Diesel	Locomotive	10 gallons	Broken fuel line	Release secured / contractor hired	NA	0	NA	NA

Significant Spill and Release Summary

Date	Material Released	Released From/ Capacity In Gallons	Volume Released	Source of Release/Cause	Corrective Actions	Effective Secondary Containment	Amount to Water	Enforcement Actions	Effectiveness of Monitoring Equipment
3/22/13	Motor Oil	Locomotive	40 gallons	Loose radiator cap	Release secured / contractor hired	NA	0	NA	NA
3/23/13	Diesel	Locomotive	Unknown	Unknown	Release secured	NA	0	NA	NA
3/29/13	Lubricating Oil	Locomotive	0.5 pints	Sump overflowed	Clean up completed	NA	0	NA	NA
5/16/13	Motor Oil	Locomotive	5 gallons	Unknown	Contractor hired	NA	0	NA	NA
6/13/13	Diesel	Locomotive	50 gallons	Leak from fuel filers	Contractor hired	NA	0	NA	NA
6/15/13	Lubricating Oil	Locomotive	20 gallons	Leak on engine	Release secured / absorbents applied	NA	0	NA	NA
6/23/13	Motor Oil	Locomotive	½ pint	Leak on engine	Release secured / absorbents applied	NA	0	NA	NA
9/12/13	Lubricating Oil	Locomotive	10 gallons	Broken valve	Contractor hired	NA	0	NA	NA
10/8/13	Lubricating Oil	Locomotive	10 gallons	Leak on locomotive	Release secured / absorbents applied	NA	0	NA	NA
12/1/13	Lubricating Oil	Locomotive	10 gallons	Leak on locomotive	Release secured / absorbents applied	NA	0	NA	NA
12/9/13	Diesel	Locomotive	25 gallons	Leak on locomotive	Release secured / contractor hired	NA	0	NA	NA
12/18/13	Lubricating Oil	Locomotive	20 gallons	Leak on locomotive	Release secured / contractor hired	NA	0	NA	NA

Significant Spill and Release Summary

Date	Material Released	Released From/ Capacity In Gallons	Volume Released	Source of Release/Cause	Corrective Actions	Effective Secondary Containment	Amount to Water	Enforcement Actions	Effectiveness of Monitoring Equipment
1/29/14	Lubricating Oil	Locomotive	½ quart	Mechanical Failure	Release secured / clean up completed	NA	0	NA	NA
2/10/14	Motor Oil	Locomotive	1 gallons	Engine failure	Release secured / clean up completed	NA	0	NA	NA
2/20/14	Diesel	Locomotive	15 gallons	Spill during fueling operation	Release secured / contractor hired	NA	0	NA	NA
5/22/14	Lubricating Oil	Locomotive	4 gallons	Leak on locomotive	Release secured / absorbents applied	NA	0	NA	NA
7/7/14	Lubricating Oil	Locomotive	10 gallons	Leak on locomotive	Release secured / absorbents applied	NA	0	NA	NA
7/11/14	Lubricating Oil	Locomotive	20 gallons	Blown engine	Release secured / contractor hired	NA	0	NA	NA
8/27/14	Gasoline	Golf Cart	2 gallons	Cracked fuel tank	Release secured / absorbents applied	NA	0	NA	NA
9/12/14	Diesel	Locomotive	0.5 pints	Leak on locomotive	Release secured / absorbents applied	NA	0	NA	NA
1/2/15	Diesel	Refrigerator Car	2 gallons	Equipment failure	Release secured / absorbents applied	NA	0	NA	NA
1/28/15	Diesel	Locomotive	1 cup	Ruptured fuel hose	Release secured / clean up completed	NA	0	NA	NA
2/11/15	Lubricating Oil	Locomotive	15 gallons	Sump overflow	Release secured / contractor hired	NA	0	NA	NA

ATTACHMENT C

EFFLUENT SCREENING

1. DMR Data
2. TMP Data
3. EPA SW Benchmark Values
4. Reduced Monitoring Frequency Evaluation – Outfall 002
5. PCB PMP Requirements

Norfolk Southern Shaffers Crossing
DMR Data - Outfall 002

	Flow		TOC	Copper, TR		Oil & Grease		TPH		pH		TSS	
	Mo Avg	Daily Max	Max Conc.	Avg Conc	Max Conc	Avg Conc	Max Conc	Avg Conc	Max Conc	Min	Max	Avg Conc	Max Conc
DMR Due Date	MGD	MGD	mg/l	ug/l	ug/l	mg/l	mg/l	mg/l	mg/l	su	su	mg/l	mg/l
10-Oct-2010	0.00216	0.00216	3.1	<QL	<QL	<QL	<QL			7.25	7.25	5	5
10-Nov-2010	0.0036	0.0036	2.2	<QL	<QL	<QL	<QL			7.02	7.02	<QL	<QL
10-Dec-2010	0.00216	0.00216	2.3	<QL	<QL	<QL	<QL			7.24	7.24	<QL	<QL
10-Jan-2011	0.0072	0.0072	2.3	<QL	<QL	<QL	<QL			6.67	6.67	7.5	7.5
10-Feb-2011	0.00288	0.00288	3.1	<QL	<QL	<QL	<QL			7.41	7.41	<QL	<QL
10-Mar-2011	0.0036	0.0036	3.8	<QL	<QL	<QL	<QL			7.53	7.53	<QL	<QL
10-Apr-2011	0.00432	0.00432	3	<20	<20	<5.0	<5.0			6.74	6.74	13	13
10-May-2011	0.00216	0.00216	2.8	<20	<20	<5.0	<5.0			7.36	7.36	8.5	8.5
10-Jun-2011	0.00288	0.00288	2.1	<20	<20	<5.0	<5.0			7.28	7.28	<5.0	<5.0
10-Jul-2011	0.0036	0.0036	3.1	<20	<20	<4.6	<4.6			6.58	6.58	5	5
10-Aug-2011	0.00432	0.00432	4.3	<20	<20	<4.7	<4.7			7.06	7.06	25	25
10-Sep-2011	0.00288	0.00288	3.5	<20	<20	<4.6	<4.6			7.25	7.25	7.5	7.5
10-Oct-2011	0.0072	0.0072	2.7	<20	<20	<4.6	<4.6	0.94	0.94	7.43	7.43	13	13
10-Nov-2011	0.00288	0.00288	2	<20	<20	<4.6	<4.6			7.14	7.14	<5.0	<5.0
10-Dec-2011	0.00432	0.00432	1.6	<20	<20	<4.7	<4.7			7.58	7.58	11	11
10-Jan-2012	0.00576	0.00576	26	<QL	<QL	<QL	<QL			7.42	7.42	9	9
10-Feb-2012	0.00432	0.00432	1.7	<20	<20	<5.0	<5.0			7.22	7.22	5	5
10-Mar-2012	0.00288	0.00288	2.4	<20	<20	<5.1	<5.1			7.05	7.05	5.5	5.5
10-Apr-2012	0.0432	0.0432	1.6	<20	<20	<4.9	<4.9			6.82	6.82	<5.0	<5.0
10-May-2012	0.00432	432	2.1	<20	<20	<4.8	<4.8			7.28	7.28	<5.0	<5.0
10-Jun-2012	0.00432	0.0576	1.9	<20	<20	<5.1	<5.1			7.37	7.37	20	35
10-Jul-2012	0.0288	0.0288	2.4	<20	<20	<4.9	<4.9			7.45	7.45	5	5
10-Aug-2012	0.00288	0.0288	3.3	<20	<20	<4.9	<4.9			7.02	7.02	<5.0	<5.0
10-Sep-2012	0.00288	0.0288	3.9	<20	<20	<4.9	<4.9			7.39	7.39	10	10
10-Oct-2012	0.0288	0.0288	2.5	<20	<20	<4.7	<4.7	0.33	0.33	6.87	6.87	6	6
10-Nov-2012	0.00288	0.0288	2.1	<20	<20	<4.8	<4.8			7.25	7.25	12	12
10-Dec-2012	0.00432	0.00432	2	<20	<20	<5.0	<5.0			6.86	6.86	<5.0	<5.0
10-Jan-2013	0.00288	0.00288	1.8	27	27	<5.0	<5.0			6.96	6.96	<5.0	<5.0
10-Feb-2013	0.00288	0.00288	2.6	<20	<20	<4.7	<4.7			6.84	6.84	<5.0	<5.0
10-Mar-2013	0.00288	0.00288	1.8	<20	<20	<4.9	<4.9			7.76	7.76	<5.0	<5.0
10-Apr-2013	0.00288	0.0288	2.1	<20	<20	<QL	<QL			7.49	7.49	<5.0	<5.0
10-May-2013	0.00144	0.00144	1.9	<20	<20	<4.9	<4.9			6.84	6.84	<5.0	<5.0
10-Jun-2013	0.00288	0.00288	1.7	<20	<20	<4.7	<4.7			7.4	7.4	<5.0	<5.0
10-Jul-2013	0.00288	0.00288	4	<20	<20	<5.1	<5.1			7.41	7.41	<5.0	<5.0
10-Aug-2013	0.00432	0.00432	1.4	<20	<20	<QL	<QL			7.62	7.62	20	20
10-Sep-2013	0.00432	0.00432	1.5	<20	<20	<QL	<QL			7	7	<5.0	<5.0
10-Oct-2013	0.00288	0.00288	1.8	<20	<20	<QL	<QL	<QL	<QL	7.36	7.36	8.5	8.5
10-Nov-2013	0.00288	0.00288	1.6	<20	<20	<QL	<QL			8.74	8.74	5	5
10-Dec-2013	0.00288	0.00288	1.1	<20	<20	<QL	<QL			7.98	7.98	<5.0	<5.0
10-Jan-2014	0.00288	0.00288	4	<20	<20	<QL	<QL			7.84	7.84	6	6
10-Feb-2014	0.00288	0.00288	1.5	<20	<20	<QL	<QL			7.7	7.7	<5.0	<5.0
10-Mar-2014	0.00432	0.00432	1.1	<20	<20	<QL	<QL			7.84	7.84	<5.0	<5.0
10-Apr-2014	0.00288	0.00288	<1.0	<20	<20	<QL	<QL			7.47	7.47	<5.0	<5.0
10-May-2014	0.00432	0.00432	1.3	<20	<20	<QL	<QL			7.34	7.34	<5.0	<5.0
10-Jun-2014	0.00432	0.00432	1.8	<20	<20	<QL	<QL			7.55	7.55	<5.0	<5.0
10-Jul-2014	0.00288	0.00288	1.4	<20	<20	<QL	<QL			7.42	7.42	<5.0	<5.0
10-Aug-2014	0.00288	0.00288	1.6	<20	<20	<QL	<QL			7.4	7.4	<5.0	<5.0
10-Sep-2014	0.00288	0.00288	2.1	<20	<20	<QL	<QL			7.14	7.14	<5.0	<5.0
10-Oct-2014	0.00576	0.00576	1.9	<20	<20	<QL	<QL	<QL	<QL	7.42	7.42	<5.0	<5.0
10-Nov-2014	0.0072	0.0072	1.7	<20	<20	<QL	<QL			7.62	7.62	<5.0	<5.0
10-Dec-2014	0.0072	0.0072	1.9	<20	<20	<QL	<QL			7.4	7.4	<5.0	<5.0
10-Jan-2015	0.01008	0.01008	2.1	<20	<20	<QL	<QL			7.19	7.19	<5.0	<5.0
10-Feb-2015	0.00576	0.00576	1.5	<20	<20	<QL	<QL			7.7	7.7	<5.0	<5.0
10-Mar-2015	0.00432	0.00432	1.9	<20	<20	<QL	<QL			7.83	7.83	<5.0	<5.0
10-Apr-2015	0.0072	0.0072	2	<20	<20	<QL	<QL			7.59	7.59	<5.0	<5.0
10-May-2015	0.00432	0.00432	2.3	<20	<20	<QL	<QL			6.92	6.92	<5.0	<5.0
10-Jun-2015	0.0072	0.0072	2	<20	<20	<QL	<QL			7.76	7.76	<1.8	<1.8
Permit Limit	NL	NL	110	29	29	10	15	NL	NL	6.0	9.0	30	60
AVG	0.0056												

Norfolk Southern Shaffers Crossing
DMR Data - Outfall 902
Storm Event Monitoring

DMR Due Date	Flow Precip Event MG	Nitrite + Nitrate mg/l	pH min su	pH max su	TSS mg/l	TPH mg/l
10-Mar-2011	0.00096				<5.0	
10-Sep-2011	0.00048	5.1	7.89	7.89	5	<4.6
10-Mar-2012	0.00144				5	
10-Sep-2012	0.00096	3.2	6.94	6.94	<5.0	<4.6
10-Mar-2013	0.00024				<5.0	
10-Sep-2013	0.00126	6.4	7.11	7.11	<5.0	<5.1
10-Mar-2014	0.0009				<5.0	
10-Sep-2014	0.0003	3.2	6.86	6.86	<5.0	<QL
10-Mar-2015	0.000196				<5.0	
Permit Limit	NL	NL	6.0	9.0	60	NL
Benchmark	NA	0.68	6.0	9.0	100	15

Form 2F Monitoring Data

Oil & Grease	<5.2 mg/l
BOD	<2.0 mg/l
COD	<10 mg/l
Total Nitrogen	3.1 mg/l
Total Phosphorus	0.23 mg/l
TR Copper	<20 µg/l
TOC	1.8 mg/l

Norfolk Southern Shaffers Crossing
DMR Data - Outfall 004
Storm Event Monitoring

DMR Due Date	Flow Precip Event MG	TSS mg/l	TPH mg/l
10-Oct-2010			0.55
10-Mar-2011	0.00144	130	
10-Aug-2011			0.94
10-Sep-2011	0.00036	25	
10-Oct-2011			0.94
10-Mar-2012	0.00144	10	
10-Aug-2012			0.33
10-Sep-2012	0.0012	63	9.8
10-Oct-2012			0.33
10-Feb-2013			<4.0
10-Mar-2013	0.00024	15	
10-Sep-2013	0.00021	<5.0	
10-Mar-2014	0.00036	340	<QL
10-Sep-2014	0.0006	130	<QL
10-Mar-2015	0.00072	200	
Permit Limit	NL	NL	NL
Benchmark	---	100	15.0

Form 2F Monitoring Data	
Oil & Grease	<4.8 mg/l
BOD	12 mg/l
COD	38 mg/l
Total Nitrogen	1.1 mg/l
Total Phosphorus	<0.10 mg/l
TR Copper	<20 µg/l
TOC	7.5 mg/l

Norfolk Southern Shaffers Crossing
DMR Data - Outfall 005
Storm Event Monitoring

DMR Due Date	Flow Precip Event MG	Nitrite + Nitrate mg/l	pH min su	pH max su	TSS mg/l	TPH mg/l
10-Mar-2011	0.00192				95	
10-Sep-2011	0.0006	0.33	7.92	7.92	17	<4.6
10-Mar-2012	0.00144				<5.0	
10-Sep-2012	0.0024	0.63	6.81	6.81	**210**	10
10-Mar-2013	0.00024				<5.0	
10-Sep-2013	0.00084	**2.17**	6.92	6.92	<5.0	<4.8
10-Mar-2014	0.0009				84	
10-Sep-2014	0.0006	0.21	8.01	8.01	91	<QL
10-Mar-2015	0.00096				**150**	
Permit Limit	NL	NL	6.0	9.0	NL	NL
Benchmark	---	0.68	6.0	9.0	100	15

Form 2F Monitoring Data	
Oil & Grease	<4.9 mg/l
BOD	<2.0 mg/l
COD	15 mg/l
Total Nitrogen	1.6 mg/l
Total Phosphorus	<0.10 mg/l
TR Copper	<20 µg/l
TOC	3.4 mg/l

NS Shaffers Crossing Toxics Management Program Test Results - VPDES Permit No. VA0001597

Table 1. Acute toxicity test results from effluent collected from Outfall 002

Test Period/Date	*Ceriodaphnia dubia*	*Pimephales Promelas*	LC50 %	%Survival in 100%	Hardness Mg/l
July 1995		X	<100%	95	
March 1996		X	<100%	100	
April 1997		X	<100%	95	272
Jan 1998		X	<100%	100	332
Dec 1998		X	<100%	100	159
Jan 2000		X	<100%	100	184
1st annual Oct 2001	X		>100%	100	145
2nd annual	No Discharge				
3rd annual Nov 2003	X		>100	100	ukn.
4th annual Nov 2004		X	>100	100	340

2001 test conducted by Central Virginia Laboratory and Consultants
2003-2004 tests conducted by Severn Trent Laboratories – Westfield, MA

Table 2. Chronic toxicity test results from effluent collected from Outfall 002

Test Period/Date	*Ceriodaphnia dubia*	*Pimephales Promelas*	NOEC (survival)	NOEC (repr/grth)	Hardness mg/l
1st quarter Oct 2001	X		100%	100%	160
		X	100%	100%	153
					145
2nd quarter Feb 2002	X		100%	100%	265
		X	100%	100%	288
					222
3rd quarter May 2002	X		100%	100%	232
		X	100%	100%	214
					220
4th quarter	No Discharge				
1st annual	No Discharge				
2nd annual Dec 2003	X		100%	100%	376
		X	100%	100%	324
					376
3rd annual Dec 2004	X		100%	12.5%*	340
		X	100%	100%	

2001-2002 tests conducted by Central Virginia Laboratory and Consultants
2003 test conducted by ProChem Analytical Inc. 2004 tests conducted by Severn Trent Laboratories – Westfield, MA
* Nonlinear dose response. No significant difference between 100% effluent and control.

TABLE 3.—PARAMETER BENCHMARK VALUES

Parameter name	Benchmark level	Source
Biochemical Oxygen Demand (5 day)	30 mg/L	4
Chemical Oxygen Demand	120 mg/L	5
Total Suspended Solids	100 mg/L	7
Oil and Grease	15 mg/L	8
Nitrate + Nitrite Nitrogen	0.68 mg/L	7
Total Phosphorus	2.0 mg/L	6
pH	6.0–9.0 s.u.	4
Acrylonitrile (c)	7.55 mg/L	2
Aluminum, Total (pH 6.5–9)	0.75 mg/L	1
Ammonia	19 mg/L	1
Antimony, Total	0.636 mg/L	9
Arsenic, Total (c)	0.16854 mg/L	9
Benzene	0.01 mg/L	10
Beryllium, Total (c)	0.13 mg/L	2
Butylbenzyl Phthalate	3 mg/L	3
Cadmium, Total (H)	0.0159 mg/L	9
Chloride	860 mg/L	1
Copper, Total (H)	0.0636 mg/L	9
Cyanide, Total	0.0636 mg/l	9
Dimethyl Phthalate	1.0 mg/L	11
Ethylbenzene	3.1 mg/L	3
Fluoranthene	0.042 mg/L	3
Fluoride	1.8 mg/L	6
Iron, Total	1.0 mg/L	12
Lead, Total (H)	0.0816 mg/L	1
Magnesium, Total	0.0636 mg/l	9
Manganese	1.0 mg/L	13
Mercury, Total	0.0024 mg/L	1
Nickel, Total (H)	1.417 mg/L	1
PCB–1016 (c)	0.000127 mg/L	9
PCB–1221 (c)	0.10 mg/L	10
PCB–1232 (c)	0.000318 mg/L	9
PCB–1242 (c)	0.00020 mg/L	10
PCB–1248 (c)	0.002544 mg/L	9
PCB–1254 (c)	0.10 mg/L	10
PCB–1260 (c)	0.000477 mg/L	9
Phenols, Total	1.0 mg/L	11
Pyrene (PAH,c)	0.01 mg/L	10
Selenium, Total (*)	0.2385 mg/L	9
Silver, Total (H)	0.0318 mg/L	9
Toluene	10.0 mg/L	3
Trichloroethylene (c)	0.0027 mg/L	3
Zinc, Total (H)	0.117 mg/L	1

Sources:
1. "EPA Recommended Ambient Water Quality Criteria." Acute Aquatic Life Freshwater.
2. "EPA Recommended Ambient Water Quality Criteria." LOEL Acute Freshwater.
3. "EPA Recommended Ambient Water Quality Criteria." Human Health Criteria for Consumption of Water and Organisms.
4. Secondary Treatment Regulations (40 CFR 133).
5. Factor of 4 times BOD5 concentration—North Carolina benchmark.
6. North Carolina storm water benchmark derived from NC Water Quality Standards.
7. National Urban Runoff Program (NURP) median concentration.
8. Median concentration of Storm Water Effluent Limitation Guideline (40 CFR Part 419).
9. Minimum Level (ML) based upon highest Method Detection Limit (MDL) times a factor of 3.18.
10. Laboratory derived Minimum Level (ML).
11. Discharge limitations and compliance data.
12. "EPA Recommended Ambient Water Quality Criteria." Chronic Aquatic Life Freshwater.
13. Colorado—Chronic Aquatic Life Freshwater—Water Quality Criteria.

Notes:
(*) Limit established for oil and gas exploration and production facilities only.
(c) carcinogen.

(H) hardness dependent.
(PAH) Polynuclear Aromatic Hydrocarbon.
Assumptions:
Receiving water temperature ¥20 C.
Receiving water pH ¥7.8.
Receiving water hardness CaCO3 100 mg/L.
Receiving water salinity 20 g/kg
Acute to Chronic Ratio (ACR) ¥10.

	Flow		TOC	Copper, TR			Oil & Grease			TPH		pH		TSS		
	Mo Avg	Daily Max	Max Conc.	Avg Conc	Max Conc		Avg Conc	Max Conc		Avg Conc	Max Conc	Min	Max	Avg Conc	Max Conc	
DMR Due Date	MGD	MGD	mg/l	ug/l	ug/l		mg/l	mg/l		mg/l	mg/l	su	su	mg/l	mg/l	
10-Jul-2012	0.0288	0.0288	2.4	<20	<20	20	<4.9	<4.9	4.9			7.45	7.45	5	5	5
10-Aug-2012	0.00288	0.0288	3.3	<20	<20	20	<4.9	<4.9	4.9			7.02	7.02	<5.0	<5.0	5
10-Sep-2012	0.00288	0.0288	3.9	<20	<20	20	<4.9	<4.9	4.9			7.39	7.39	10	10	10
10-Oct-2012	0.0288	0.0288	2.5	<20	<20	20	<4.7	<4.7	4.7	0.33	0.33	6.87	6.87	6	6	6
10-Nov-2012	0.00288	0.0288	2.1	<20	<20	20	<4.8	<4.8	4.8			7.25	7.25	12	12	12
10-Dec-2012	0.00432	0.00432	2	<20	<20	20	<5.0	<5.0	5			6.86	6.86	<5.0	<5.0	5
10-Jan-2013	0.00288	0.00288	1.8	27	27	27	<5.0	<5.0	5			6.96	6.96	<5.0	<5.0	5
10-Feb-2013	0.00288	0.00288	2.6	<20	<20	20	<4.7	<4.7	4.7			6.84	6.84	<5.0	<5.0	5
10-Mar-2013	0.00288	0.00288	1.8	<20	<20	20	<4.9	<4.9	4.9			7.76	7.76	<5.0	<5.0	5
10-Apr-2013	0.00288	0.0288	2.1	<20	<20	20	<QL	<QL	5			7.49	7.49	<5.0	<5.0	5
10-May-2013	0.00144	0.00144	1.9	<20	<20	20	<4.9	<4.9	4.9			6.84	6.84	<5.0	<5.0	5
10-Jun-2013	0.00288	0.00288	1.7	<20	<20	20	<4.7	<4.7	4.7			7.4	7.4	<5.0	<5.0	5
10-Jul-2013	0.00288	0.00288	4	<20	<20	20	<5.1	<5.1	5.1			7.41	7.41	<5.0	<5.0	5
10-Aug-2013	0.00432	0.00432	1.4	<20	<20	20	<QL	<QL	5			7.62	7.62	20	20	20
10-Sep-2013	0.00432	0.00432	1.5	<20	<20	20	<QL	<QL	5			7	7	<5.0	<5.0	5
10-Oct-2013	0.00288	0.00288	1.8	<20	<20	20	<QL	<QL	5	<QL	<QL	7.36	7.36	8.5	8.5	8.5
10-Nov-2013	0.00288	0.00288	1.6	<20	<20	20	<QL	<QL	5			8.74	8.74	5	5	5
10-Dec-2013	0.00288	0.00288	1.1	<20	<20	20	<QL	<QL	5			7.98	7.98	<5.0	<5.0	5
10-Jan-2014	0.00288	0.00288	4	<20	<20	20	<QL	<QL	5			7.84	7.84	6	6	6
10-Feb-2014	0.00288	0.00288	1.5	<20	<20	20	<QL	<QL	5			7.7	7.7	<5.0	<5.0	5
10-Mar-2014	0.00432	0.00432	1.1	<20	<20	20	<QL	<QL	5			7.84	7.84	<5.0	<5.0	5
10-Apr-2014	0.00288	0.00288	<1.0	<20	<20	20	<QL	<QL	5			7.47	7.47	<5.0	<5.0	5
10-May-2014	0.00432	0.00432	1.3	<20	<20	20	<QL	<QL	5			7.34	7.34	<5.0	<5.0	5
10-Jun-2014	0.00432	0.00432	1.8	<20	<20	20	<QL	<QL	5			7.55	7.55	<5.0	<5.0	5
10-Jul-2014	0.00288	0.00288	1.4	<20	<20	20	<QL	<QL	5			7.42	7.42	<5.0	<5.0	5
10-Aug-2014	0.00288	0.00288	1.6	<20	<20	20	<QL	<QL	5			7.4	7.4	<5.0	<5.0	5
10-Sep-2014	0.00288	0.00288	2.1	<20	<20	20	<QL	<QL	5			7.14	7.14	<5.0	<5.0	5
10-Oct-2014	0.00576	0.00576	1.9	<20	<20	20	<QL	<QL	5	<QL	<QL	7.42	7.42	<5.0	<5.0	5
10-Nov-2014	0.0072	0.0072	1.7	<20	<20	20	<QL	<QL	5			7.62	7.62	<5.0	<5.0	5
10-Dec-2014	0.0072	0.0072	1.9	<20	<20	20	<QL	<QL	5			7.4	7.4	<5.0	<5.0	5
10-Jan-2015	0.01008	0.01008	2.1	<20	<20	20	<QL	<QL	5			7.19	7.19	<5.0	<5.0	5
10-Feb-2015	0.00576	0.00576	1.5	<20	<20	20	<QL	<QL	5			7.7	7.7	<5.0	<5.0	5
10-Mar-2015	0.00432	0.00432	1.9	<20	<20	20	<QL	<QL	5			7.83	7.83	<5.0	<5.0	5
10-Apr-2015	0.0072	0.0072	2	<20	<20	20	<QL	<QL	5			7.59	7.59	<5.0	<5.0	5
10-May-2015	0.00432	0.00432	2.3	<20	<20	20	<QL	<QL	5			6.92	6.92	<5.0	<5.0	5
10-Jun-2015	0.0072	0.0072	2	<20	<20	20	<QL	<QL	5			7.76	7.76	<1.8	<1.8	1.8
			2.05		20	20.2	5		5.0			6.84	8.74	5.8	5.8	5.8
		Limit:	110			29	10		15			6	9	30		60
			2%			70%	50%		33%					19%		10%
		Frequency	1/6M			1/M	1/M		1/3M					1/6M		1/6M

ATTACHMENT D

EFFLUENT LIMITATIONS

1. WLA Spreadsheets from previous permit reissuance
2. STATS.EXE printouts from previous permit reissuance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: NS Shaffers Crossing - 002

Permit No.: VA0001597

Receiving Stream: Lick Run, UT

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	226	mg/L
90% Temperature (Annual) =		deg C
90% Temperature (Wet season) =		deg C
90% Maximum pH =		SU
10% Maximum pH =		SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	n	
Trout Present Y/N? =	n	
Early Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD
Annual Average =	0	MGD

Mixing Information

Annual - 1Q10 Mix =	50 %
- 7Q10 Mix =	50 %
- 30Q10 Mix =	50 %
Wet Season - 1Q10 Mix =	50 %
- 30Q10 Mix =	50 %

Effluent Information

Mean Hardness (as CaCO3) =	226	mg/L
90% Temp (Annual) =		deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =		SU
10% Maximum pH =		SU
Discharge Flow =	0.072	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenapthene	0	–	–	na	2.7E+03	–	–	na	2.7E+03	–	–	–	–	–	–	–	–	–	–	na	2.7E+03
Acrolein	0	–	–	na	7.8E+02	–	–	na	7.8E+02	–	–	–	–	–	–	–	–	–	–	na	7.8E+02
Acrylonitrile [C]	0	–	–	na	6.6E+00	–	–	na	6.6E+00	–	–	–	–	–	–	–	–	–	–	na	6.6E+00
Aldrin [C]	0	3.0E+00	–	na	1.4E-03	3.0E+00	–	na	1.4E-03	–	–	–	–	–	–	–	–	3.0E+00	–	na	1.4E-03
Ammonia-N (mg/l) Yearly)	0	5.84E+01	7.09E+00	na	–	5.8E+01	7.1E+00	na	–	–	–	–	–	–	–	–	–	5.8E+01	7.1E+00	na	–
Ammonia-N (mg/l) High Flow)	0	5.84E+01	7.09E+00	na	–	5.8E+01	7.1E+00	na	–	–	–	–	–	–	–	–	–	5.8E+01	7.1E+00	na	–
Anthracene	0	–	–	na	1.1E+05	–	–	na	1.1E+05	–	–	–	–	–	–	–	–	–	–	na	1.1E+05
Antimony	0	–	–	na	4.3E+03	–	–	na	4.3E+03	–	–	–	–	–	–	–	–	–	–	na	4.3E+03
Arsenic	0	3.4E+02	1.5E+02	na	–	3.4E+02	1.5E+02	na	–	–	–	–	–	–	–	–	–	3.4E+02	1.5E+02	na	–
Barium	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Benzene [C]	0	–	–	na	7.1E+02	–	–	na	7.1E+02	–	–	–	–	–	–	–	–	–	–	na	7.1E+02
Benzidine [C]	0	–	–	na	5.4E-03	–	–	na	5.4E-03	–	–	–	–	–	–	–	–	–	–	na	5.4E
Benzo (a) anthracene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9L
Benzo (b) fluoranthene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
Benzo (k) fluoranthene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
Benzo (a) pyrene [C]	0	–	–	na	1.4E+01	–	–	na	1.4E+01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
Bis2-Chloroethyl Ether	0	–	–	na	1.7E+05	–	–	na	1.7E+05	–	–	–	–	–	–	–	–	–	–	na	1.4E+01
Bis2-Chloroisopropyl Ether	0	–	–	na	3.6E+03	–	–	na	3.6E+03	–	–	–	–	–	–	–	–	–	–	na	1.7E+05
Bromoform [C]	0	–	–	na	5.2E+03	–	–	na	5.2E+03	–	–	–	–	–	–	–	–	–	–	na	3.6E+03
Butylbenzylphthalate	0	9.8E+00	2.2E+00	na	–	9.8E+00	2.2E+00	na	–	–	–	–	–	–	–	–	–	–	–	na	5.2E+03
Cadmium	0	–	–	na	4.4E+01	–	–	na	4.4E+01	–	–	–	–	–	–	–	–	9.8E+00	2.2E+00	na	–
Carbon Tetrachloride [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	–	–	–	–	–	–	–	–	–	–	na	4.4E+01
Chlordane [C]	0	8.6E+05	2.3E+05	na	–	8.6E+05	2.3E+05	na	–	–	–	–	–	–	–	–	–	2.4E+00	4.3E-03	na	2.2E-02
Chloride	0	1.9E+01	1.1E+01	na	–	1.9E+01	1.1E+01	na	–	–	–	–	–	–	–	–	–	8.6E+05	2.3E+05	na	–
TRC	0	–	–	na	2.1E+04	–	–	na	2.1E+04	–	–	–	–	–	–	–	–	1.9E+01	1.1E+01	na	–
Chlorobenzene	0																	–	–	na	2.1E+04

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane [C]	0	--	--	na	3.4E+02	--	--	na	3.4E+02	--	--	--	--	--	--	--	--	--	--	na	3.4E+02
Chloroform [C]	0	--	--	na	2.9E+04	--	--	na	2.9E+04	--	--	--	--	--	--	--	--	--	--	na	2.9E+04
-Chloronaphthalene	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
-Chlorophenol	0	--	--	na	4.0E+02	--	--	na	4.0E+02	--	--	--	--	--	--	--	--	--	--	na	4.0E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	na	--
Chromium III	0	1.1E+03	1.4E+02	na	--	1.1E+03	1.4E+02	na	--	--	--	--	--	--	--	--	--	1.1E+03	1.4E+02	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Chromium, Total	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Copper	0	2.9E+01	1.8E+01	na	--	2.9E+01	1.8E+01	na	--	--	--	--	--	--	--	--	--	2.9E+01	1.8E+01	na	--
Cyanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	na	2.2E+05
DD [C]	0	--	--	na	8.4E-03	--	--	na	8.4E-03	--	--	--	--	--	--	--	--	--	--	na	8.4E-03
DE [C]	0	--	--	na	5.9E-03	--	--	na	5.9E-03	--	--	--	--	--	--	--	--	--	--	na	5.9E-03
DT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	--	--	--	--	--	--	--	--	1.1E+00	1.0E-03	na	5.9E-03
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
Dibutyl phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
Dichloromethane Methylene Chloride) [C]	0	--	--	na	1.6E+04	--	--	na	1.6E+04	--	--	--	--	--	--	--	--	--	--	na	1.6E+04
,2-Dichlorobenzene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
,3-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
,4-Dichlorobenzene	0	--	--	na	2.6E+03	--	--	na	2.6E+03	--	--	--	--	--	--	--	--	--	--	na	2.6E+03
,3-Dichlorobenzidine [C]	0	--	--	na	7.7E-01	--	--	na	7.7E-01	--	--	--	--	--	--	--	--	--	--	na	7.7E-01
Dichlorobromomethane [C]	0	--	--	na	4.6E+02	--	--	na	4.6E+02	--	--	--	--	--	--	--	--	--	--	na	4.6E+02
,2-Dichloroethane [C]	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	--	--	na	9.9E+02
,1-Dichloroethylene	0	--	--	na	1.7E+04	--	--	na	1.7E+04	--	--	--	--	--	--	--	--	--	--	na	1.7E+04
,2-trans-dichloroethylene	0	--	--	na	1.4E+05	--	--	na	1.4E+05	--	--	--	--	--	--	--	--	--	--	na	1.4E+05
,4-Dichlorophenol	0	--	--	na	7.9E+02	--	--	na	7.9E+02	--	--	--	--	--	--	--	--	--	--	na	7.9E+02
,4-Dichlorophenoxy cetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
,2-Dichloropropane [C]	0	--	--	na	3.9E+02	--	--	na	3.9E+02	--	--	--	--	--	--	--	--	--	--	na	3.9E+02
,3-Dichloropropene	0	--	--	na	1.7E+03	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Dieldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	na	1.4E-03
Diethyl Phthalate	0	--	--	na	1.2E+05	--	--	na	1.2E+05	--	--	--	--	--	--	--	--	--	--	na	1.2E
Di-2-Ethylhexyl Phthalate [C]	0	--	--	na	5.9E+01	--	--	na	5.9E+01	--	--	--	--	--	--	--	--	--	--	na	5.9E+0
,4-Dimethylphenol	0	--	--	na	2.3E+03	--	--	na	2.3E+03	--	--	--	--	--	--	--	--	--	--	na	2.3E+03
Dimethyl Phthalate	0	--	--	na	2.9E+06	--	--	na	2.9E+06	--	--	--	--	--	--	--	--	--	--	na	2.9E+06
Di-n-Butyl Phthalate	0	--	--	na	1.2E+04	--	--	na	1.2E+04	--	--	--	--	--	--	--	--	--	--	na	1.2E+04
,4 Dinitrophenol	0	--	--	na	1.4E+04	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
-Methyl-4,6-Dinitrophenol	0	--	--	na	7.65E+02	--	--	na	7.7E+02	--	--	--	--	--	--	--	--	--	--	na	7.7E+02
,4-Dinitrotoluene [C]	0	--	--	na	9.1E+01	--	--	na	9.1E+01	--	--	--	--	--	--	--	--	--	--	na	9.1E+01
Dioxin (2,3,7,8-etrachlorodibenzo-p-dioxin) opq)	0	--	--	na	1.2E-06	--	--	na	na	--	--	--	--	--	--	--	--	--	--	na	na
,2-Diphenylhydrazine [C]	0	--	--	na	5.4E+00	--	--	na	5.4E+00	--	--	--	--	--	--	--	--	--	--	na	5.4E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	2.4E+02
Endosulfan Sulfate	0	--	--	na	2.4E+02	--	--	na	2.4E+02	--	--	--	--	--	--	--	--	--	--	na	2.4E+02
Endrin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	na	8.1E-01
Endrin Aldehyde	0	--	--	na	8.1E-01	--	--	na	8.1E-01	--	--	--	--	--	--	--	--	--	--	na	8.1E-01

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	–	–	na	2.9E+04	–	–	na	2.9E+04	–	–	–	–	–	–	–	–	–	–	na	2.9E+04
Fluoranthene	0	–	–	na	3.7E+02	–	–	na	3.7E+02	–	–	–	–	–	–	–	–	–	–	na	3.7E+02
Fluorene	0	–	–	na	1.4E+04	–	–	na	1.4E+04	–	–	–	–	–	–	–	–	–	–	na	1.4E+04
Foaming Agents	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Guthion	0	–	1.0E-02	na	–	–	1.0E-02	na	–	–	–	–	–	–	–	–	–	–	1.0E-02	na	–
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	–	–	–	–	–	–	–	–	5.2E-01	3.8E-03	na	2.1E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	–	–	–	–	–	–	–	–	5.2E-01	3.8E-03	na	1.1E-03
Hexachlorobenzene [C]	0	–	–	na	7.7E-03	–	–	na	7.7E-03	–	–	–	–	–	–	–	–	–	–	na	7.7E-03
Hexachlorobutadiene [C]	0	–	–	na	5.0E+02	–	–	na	5.0E+02	–	–	–	–	–	–	–	–	–	–	na	5.0E+02
Hexachlorocyclohexane Alpha-BHC [C]	0	–	–	na	1.3E-01	–	–	na	1.3E-01	–	–	–	–	–	–	–	–	–	–	na	1.3E-01
Hexachlorocyclohexane Beta-BHC [C]	0	–	–	na	4.6E-01	–	–	na	4.6E-01	–	–	–	–	–	–	–	–	–	–	na	4.6E-01
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	–	na	6.3E-01	–	–	–	–	–	–	–	–	9.5E-01	–	na	6.3E-01
Hexachlorocyclopentadiene	0	–	–	na	1.7E+04	–	–	na	1.7E+04	–	–	–	–	–	–	–	–	–	–	na	1.7E
Hexachloroethane [C]	0	–	–	na	8.9E+01	–	–	na	8.9E+01	–	–	–	–	–	–	–	–	–	–	na	8.9E+01
Hydrogen Sulfide	0	–	2.0E+00	na	–	–	2.0E+00	na	–	–	–	–	–	–	–	–	–	–	2.0E+00	na	–
Indeno (1,2,3-cd) pyrene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
Iron	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Isophorone [C]	0	–	–	na	2.6E+04	–	–	na	2.6E+04	–	–	–	–	–	–	–	–	–	–	na	2.6E+04
Kepone	0	–	0.0E+00	na	–	–	0.0E+00	na	–	–	–	–	–	–	–	–	–	–	0.0E+00	na	–
Lead	0	3.4E+02	3.8E+01	na	–	3.4E+02	3.8E+01	na	–	–	–	–	–	–	–	–	–	3.4E+02	3.8E+01	na	–
Malathion	0	–	1.0E-01	na	–	–	1.0E-01	na	–	–	–	–	–	–	–	–	–	–	1.0E-01	na	–
Manganese	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	–	–	–	–	–	–	–	–	1.4E+00	7.7E-01	na	5.1E-02
Methyl Bromide	0	–	–	na	4.0E+03	–	–	na	4.0E+03	–	–	–	–	–	–	–	–	–	–	na	4.0E+03
Methoxychlor	0	–	3.0E-02	na	–	–	3.0E-02	na	–	–	–	–	–	–	–	–	–	–	3.0E-02	na	–
Mirex	0	–	0.0E+00	na	–	–	0.0E+00	na	–	–	–	–	–	–	–	–	–	–	0.0E+00	na	–
Monochlorobenzene	0	–	–	na	2.1E+04	–	–	na	2.1E+04	–	–	–	–	–	–	–	–	–	–	na	2.1E+04
Nickel	0	3.6E+02	4.0E+01	na	4.6E+03	3.6E+02	4.0E+01	na	4.6E+03	–	–	–	–	–	–	–	–	3.6E+02	4.0E+01	na	4.6E+03
Nitrate (as N)	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Nitrobenzene	0	–	–	na	1.9E+03	–	–	na	1.9E+03	–	–	–	–	–	–	–	–	–	–	na	1.9E+
N-Nitrosodimethylamine [C]	0	–	–	na	8.1E+01	–	–	na	8.1E+01	–	–	–	–	–	–	–	–	–	–	na	8.1E
N-Nitrosodiphenylamine [C]	0	–	–	na	1.6E+02	–	–	na	1.6E+02	–	–	–	–	–	–	–	–	–	–	na	1.6E+02
N-Nitrosodi-n-propylamine [C]	0	–	–	na	1.4E+01	–	–	na	1.4E+01	–	–	–	–	–	–	–	–	–	–	na	1.4E+01
Parathion	0	6.5E-02	1.3E-02	na	–	6.5E-02	1.3E-02	na	–	–	–	–	–	–	–	–	–	6.5E-02	1.3E-02	na	–
PCB-1016	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1221	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1232	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1242	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1248	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1254	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1260	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB Total [C]	0	–	–	na	1.7E-03	–	–	na	1.7E-03	–	–	–	–	–	–	–	–	–	–	na	1.7E-03

arameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
g/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
ntachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	7.7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	7.7E-03	5.9E-03	na	8.2E+01
enol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	--	--	--	--	--	--	--	--	na	4.6E+06
rene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
dionuclides (pCi/l																					
cept Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	--	--	na	1.5E+01
Beta and Photon Activity rem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	--	--	--	--	--	--	--	--	na	4.0E+00
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	--	--	na	8.0E+00
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	--	--	na	2.0E+04
lenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.0E+01	5.0E+00	na	1.1E+04	--	--	--	--	--	--	--	--	2.0E+01	5.0E+00	na	1.1E+04
ver	0	1.4E+01	--	na	--	1.4E+01	--	na	--	--	--	--	--	--	--	--	--	1.4E+01	--	na	--
lfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	--	--	na	1.1E+02
trachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
allium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	--	--	--	--	--	--	--	--	na	6.3E
luene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	--	--	na	2.0E+
tal dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
xaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.3E-01	2.0E-04	na	7.5E-03	--	--	--	--	--	--	--	--	7.3E-01	2.0E-04	na	7.5E-03
butyltin	0	4.6E-01	6.3E-02	na	--	4.6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	4.6E-01	6.3E-02	na	--
,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	--	--	--	--	--	--	--	--	na	9.4E+02
,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	--	--	na	4.2E+02
chloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	--	--	--	--	--	--	--	--	na	8.1E+02
,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	--	--	--	--	--	--	--	--	na	6.5E+01
2,4,5-Trichlorophenoxy) pionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
yl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	--	--	na	6.1E+01
c	0	2.3E+02	2.4E+02	na	6.9E+04	2.3E+02	2.4E+02	na	6.9E+04	--	--	--	--	--	--	--	--	2.3E+02	2.4E+02	na	6.9E+04

es:

All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise

Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals

Metals measured as Dissolved, unless specified otherwise

"C" indicates a carcinogenic parameter

Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.

Antidegradation WLAs are based upon a complete mix.

Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic

= (0.1(WQC - background conc.) + background conc.) for human health

WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+03
Arsenic	9.0E+01
Barium	na
Cadmium	1.3E+00
Chromium III	8.7E+01
Chromium VI	6.4E+00
Copper	1.1E+01
Iron	na
Lead	2.3E+01
Manganese	na
Mercury	5.1E-02
Nickel	2.4E+01
Selenium	3.0E+00
Silver	5.6E+00
Zinc	9.4E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

acility Name: NS Shaffers Crossing - 005 Permit No.: VA0001597

eceiving Stream: Hortons Branch

Version: OWP Guidance Memo 00-2011 (8/24/00)

tream Information

lean Hardness (as CaCO3) =	630	mg/L
0% Temperature (Annual) =		deg C
0% Temperature (Wet season) =		deg C
0% Maximum pH =		SU
0% Maximum pH =		SU
ier Designation (1 or 2) =	1	
ublic Water Supply (PWS) Y/N? =	n	
rout Present Y/N? =	n	
arly Life Stages Present Y/N? =	y	

Stream Flows

1Q10 (Annual) =	0	MGD
7Q10 (Annual) =	0	MGD
30Q10 (Annual) =	0	MGD
1Q10 (Wet season) =	0	MGD
30Q10 (Wet season)	0	MGD
30Q5 =	0	MGD
Harmonic Mean =	0	MGD
Annual Average =	0	MGD

Mixing Information

Annual - 1Q10 Mix =	50	%
- 7Q10 Mix =	50	%
- 30Q10 Mix =	50	%
Wet Season - 1Q10 Mix =	50	%
- 30Q10 Mix =	50	%

Effluent Information

Mean Hardness (as CaCO3) =	630	mg/L
90% Temp (Annual) =		deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =		SU
10% Maximum pH =		SU
Discharge Flow =	0.0576	MGD

arameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
g/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
cenapthene	0	--	--	na	2.7E+03	--	--	na	2.7E+03	--	--	--	--	--	--	--	--	--	--	na	2.7E+03
crolein	0	--	--	na	7.8E+02	--	--	na	7.8E+02	--	--	--	--	--	--	--	--	--	--	na	7.8E+02
crylonitrile[C]	0	--	--	na	6.6E+00	--	--	na	6.6E+00	--	--	--	--	--	--	--	--	--	--	na	6.6E+00
drin [C]	0	3.0E+00	--	na	1.4E-03	3.0E+00	--	na	1.4E-03	--	--	--	--	--	--	--	--	3.0E+00	--	na	1.4E-03
mmonia-N (mg/l) early)	0	5.84E+01	7.09E+00	na	--	5.8E+01	7.1E+00	na	--	--	--	--	--	--	--	--	--	5.8E+01	7.1E+00	na	--
mmonia-N (mg/l) ligh Flow)	0	5.84E+01	7.09E+00	na	--	5.8E+01	7.1E+00	na	--	--	--	--	--	--	--	--	--	5.8E+01	7.1E+00	na	--
nthracene	0	--	--	na	1.1E+05	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	--	--	na	1.1E+05
ntimony	0	--	--	na	4.3E+03	--	--	na	4.3E+03	--	--	--	--	--	--	--	--	--	--	na	4.3E+03
rsenic	0	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	3.4E+02	1.5E+02	na	--
arium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
enzene [C]	0	--	--	na	7.1E+02	--	--	na	7.1E+02	--	--	--	--	--	--	--	--	--	--	na	7.1E+02
enzidine[C]	0	--	--	na	5.4E-03	--	--	na	5.4E-03	--	--	--	--	--	--	--	--	--	--	na	5.4E-03
enzo (a) anthracene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
enzo (b) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
enzo (k) fluoranthene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
enzo (a) pyrene [C]	0	--	--	na	4.9E-01	--	--	na	4.9E-01	--	--	--	--	--	--	--	--	--	--	na	4.9E-01
s2-Chloroethyl Ether	0	--	--	na	1.4E+01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	--	--	na	1.4E+01
s2-Chloroisopropyl Ether	0	--	--	na	1.7E+05	--	--	na	1.7E+05	--	--	--	--	--	--	--	--	--	--	na	1.7E+05
omoform [C]	0	--	--	na	3.6E+03	--	--	na	3.6E+03	--	--	--	--	--	--	--	--	--	--	na	3.6E+03
tylbenzylphthalate	0	--	--	na	5.2E+03	--	--	na	5.2E+03	--	--	--	--	--	--	--	--	--	--	na	5.2E+03
dmium	0	1.9E+01	3.4E+00	na	--	1.9E+01	3.4E+00	na	--	--	--	--	--	--	--	--	--	1.9E+01	3.4E+00	na	--
rbon Tetrachloride [C]	0	--	--	na	4.4E+01	--	--	na	4.4E+01	--	--	--	--	--	--	--	--	--	--	na	4.4E+01
lordane [C]	0	2.4E+00	4.3E-03	na	2.2E-02	2.4E+00	4.3E-03	na	2.2E-02	--	--	--	--	--	--	--	--	2.4E+00	4.3E-03	na	2.2E-02
loride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	8.6E+05	2.3E+05	na	--
C	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.9E+01	1.1E+01	na	--
lorobenzene	0	--	--	na	2.1E+04	--	--	na	2.1E+04	--	--	--	--	--	--	--	--	--	--	na	2.1E+04

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
hlorodibromomethane [C]	0	–	–	na	3.4E+02	–	–	na	3.4E+02	–	–	–	–	–	–	–	–	–	–	na	3.4E+02
hloroform [C]	0	–	–	na	2.9E+04	–	–	na	2.9E+04	–	–	–	–	–	–	–	–	–	–	na	2.9E+04
-Chloronaphthalene	0	–	–	na	4.3E+03	–	–	na	4.3E+03	–	–	–	–	–	–	–	–	–	–	na	4.3E+03
-Chlorophenol	0	–	–	na	4.0E+02	–	–	na	4.0E+02	–	–	–	–	–	–	–	–	–	–	na	4.0E+02
hlorpyrifos	0	8.3E-02	4.1E-02	na	–	8.3E-02	4.1E-02	na	–	–	–	–	–	–	–	–	–	8.3E-02	4.1E-02	na	–
hromium III	0	1.8E+03	2.3E+02	na	–	1.8E+03	2.3E+02	na	–	–	–	–	–	–	–	–	–	1.8E+03	2.3E+02	na	–
hromium VI	0	1.6E+01	1.1E+01	na	–	1.6E+01	1.1E+01	na	–	–	–	–	–	–	–	–	–	1.6E+01	1.1E+01	na	–
hromium, Total	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
hrysene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
opper	0	5.0E+01	2.9E+01	na	–	5.0E+01	2.9E+01	na	–	–	–	–	–	–	–	–	–	5.0E+01	2.9E+01	na	–
yanide	0	2.2E+01	5.2E+00	na	2.2E+05	2.2E+01	5.2E+00	na	2.2E+05	–	–	–	–	–	–	–	–	2.2E+01	5.2E+00	na	2.2E+05
DD [C]	0	–	–	na	8.4E-03	–	–	na	8.4E-03	–	–	–	–	–	–	–	–	–	–	na	8.4E-03
DE [C]	0	–	–	na	5.9E-03	–	–	na	5.9E-03	–	–	–	–	–	–	–	–	–	–	na	5.9E-03
DT [C]	0	1.1E+00	1.0E-03	na	5.9E-03	1.1E+00	1.0E-03	na	5.9E-03	–	–	–	–	–	–	–	–	1.1E+00	1.0E-03	na	5.9E-03
emeton	0	–	1.0E-01	na	–	–	1.0E-01	na	–	–	–	–	–	–	–	–	–	–	1.0E-01	na	–
ibenz(a,h)anthracene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
ibutyl phthalate	0	–	–	na	1.2E+04	–	–	na	1.2E+04	–	–	–	–	–	–	–	–	–	–	na	1.2E+04
ichloromethane (Methylene Chloride) [C]	0	–	–	na	1.6E+04	–	–	na	1.6E+04	–	–	–	–	–	–	–	–	–	–	na	1.6E+04
2-Dichlorobenzene	0	–	–	na	1.7E+04	–	–	na	1.7E+04	–	–	–	–	–	–	–	–	–	–	na	1.7E+04
3-Dichlorobenzene	0	–	–	na	2.6E+03	–	–	na	2.6E+03	–	–	–	–	–	–	–	–	–	–	na	2.6E+03
4-Dichlorobenzene	0	–	–	na	2.6E+03	–	–	na	2.6E+03	–	–	–	–	–	–	–	–	–	–	na	2.6E+03
3-Dichlorobenzidine [C]	0	–	–	na	7.7E-01	–	–	na	7.7E-01	–	–	–	–	–	–	–	–	–	–	na	7.7E-01
chlorobromomethane [C]	0	–	–	na	4.6E+02	–	–	na	4.6E+02	–	–	–	–	–	–	–	–	–	–	na	4.6E+02
2-Dichloroethane [C]	0	–	–	na	9.9E+02	–	–	na	9.9E+02	–	–	–	–	–	–	–	–	–	–	na	9.9E+02
1-Dichloroethylene	0	–	–	na	1.7E+04	–	–	na	1.7E+04	–	–	–	–	–	–	–	–	–	–	na	1.7E+04
2-trans-dichloroethylene	0	–	–	na	1.4E+05	–	–	na	1.4E+05	–	–	–	–	–	–	–	–	–	–	na	1.4E+05
4-Dichlorophenol	0	–	–	na	7.9E+02	–	–	na	7.9E+02	–	–	–	–	–	–	–	–	–	–	na	7.9E+02
4-Dichlorophenoxy etic acid (2,4-D)	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
2-Dichloropropane [C]	0	–	–	na	3.9E+02	–	–	na	3.9E+02	–	–	–	–	–	–	–	–	–	–	na	3.9E+02
3-Dichloropropene	0	–	–	na	1.7E+03	–	–	na	1.7E+03	–	–	–	–	–	–	–	–	–	–	na	1.7E+03
eldrin [C]	0	2.4E-01	5.6E-02	na	1.4E-03	2.4E-01	5.6E-02	na	1.4E-03	–	–	–	–	–	–	–	–	2.4E-01	5.6E-02	na	1.4E-03
ethyl Phthalate	0	–	–	na	1.2E+05	–	–	na	1.2E+05	–	–	–	–	–	–	–	–	–	–	na	1.2E
-2-Ethylhexyl Phthalate [C]	0	–	–	na	5.9E+01	–	–	na	5.9E+01	–	–	–	–	–	–	–	–	–	–	na	5.9E+01
4-Dimethylphenol	0	–	–	na	2.3E+03	–	–	na	2.3E+03	–	–	–	–	–	–	–	–	–	–	na	2.3E+03
methyl Phthalate	0	–	–	na	2.9E+06	–	–	na	2.9E+06	–	–	–	–	–	–	–	–	–	–	na	2.9E+06
-n-Butyl Phthalate	0	–	–	na	1.2E+04	–	–	na	1.2E+04	–	–	–	–	–	–	–	–	–	–	na	1.2E+04
4 Dinitrophenol	0	–	–	na	1.4E+04	–	–	na	1.4E+04	–	–	–	–	–	–	–	–	–	–	na	1.4E+04
Methyl-4,6-Dinitrophenol	0	–	–	na	7.65E+02	–	–	na	7.7E+02	–	–	–	–	–	–	–	–	–	–	na	7.7E+02
I-Dinitrotoluene [C]	0	–	–	na	9.1E+01	–	–	na	9.1E+01	–	–	–	–	–	–	–	–	–	–	na	9.1E+01
oxin (2,3,7,8-rachlorodibenzo-p-dioxin) oq)	0	–	–	na	1.2E-06	–	–	na	na	–	–	–	–	–	–	–	–	–	–	na	na
-Diphenylhydrazine [C]	0	–	–	na	5.4E+00	–	–	na	5.4E+00	–	–	–	–	–	–	–	–	–	–	na	5.4E+00
ha-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	–	–	–	–	–	–	–	–	2.2E-01	5.6E-02	na	2.4E+02
ta-Endosulfan	0	2.2E-01	5.6E-02	na	2.4E+02	2.2E-01	5.6E-02	na	2.4E+02	–	–	–	–	–	–	–	–	2.2E-01	5.6E-02	na	2.4E+02
dosulfan Sulfate	0	–	–	na	2.4E+02	–	–	na	2.4E+02	–	–	–	–	–	–	–	–	–	–	na	2.4E+02
drin	0	8.6E-02	3.6E-02	na	8.1E-01	8.6E-02	3.6E-02	na	8.1E-01	–	–	–	–	–	–	–	–	8.6E-02	3.6E-02	na	8.1E-01
drin Aldehyde	0	–	–	na	8.1E-01	–	–	na	8.1E-01	–	–	–	–	–	–	–	–	–	–	na	8.1E-01

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	–	–	na	2.9E+04	–	–	na	2.9E+04	–	–	–	–	–	–	–	–	–	–	na	2.9E+04
Fluoranthene	0	–	–	na	3.7E+02	–	–	na	3.7E+02	–	–	–	–	–	–	–	–	–	–	na	3.7E+02
Fluorene	0	–	–	na	1.4E+04	–	–	na	1.4E+04	–	–	–	–	–	–	–	–	–	–	na	1.4E+04
Foaming Agents	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Guthion	0	–	1.0E-02	na	–	–	1.0E-02	na	–	–	–	–	–	–	–	–	–	–	1.0E-02	na	–
Heptachlor [C]	0	5.2E-01	3.8E-03	na	2.1E-03	5.2E-01	3.8E-03	na	2.1E-03	–	–	–	–	–	–	–	–	5.2E-01	3.8E-03	na	2.1E-03
Heptachlor Epoxide [C]	0	5.2E-01	3.8E-03	na	1.1E-03	5.2E-01	3.8E-03	na	1.1E-03	–	–	–	–	–	–	–	–	5.2E-01	3.8E-03	na	1.1E-03
Hexachlorobenzene [C]	0	–	–	na	7.7E-03	–	–	na	7.7E-03	–	–	–	–	–	–	–	–	–	–	na	7.7E-03
Hexachlorobutadiene [C]	0	–	–	na	5.0E+02	–	–	na	5.0E+02	–	–	–	–	–	–	–	–	–	–	na	5.0E+02
Hexachlorocyclohexane Alpha-BHC [C]	0	–	–	na	1.3E-01	–	–	na	1.3E-01	–	–	–	–	–	–	–	–	–	–	na	1.3E-01
Hexachlorocyclohexane Beta-BHC [C]	0	–	–	na	4.6E-01	–	–	na	4.6E-01	–	–	–	–	–	–	–	–	–	–	na	4.6E-01
Hexachlorocyclohexane Gamma-BHC [C] (Lindane)	0	9.5E-01	na	na	6.3E-01	9.5E-01	–	na	6.3E-01	–	–	–	–	–	–	–	–	9.5E-01	–	na	6.3E-01
Hexachlorocyclopentadiene	0	–	–	na	1.7E+04	–	–	na	1.7E+04	–	–	–	–	–	–	–	–	–	–	na	1.7E
Hexachloroethane [C]	0	–	–	na	8.9E+01	–	–	na	8.9E+01	–	–	–	–	–	–	–	–	–	–	na	8.9E+01
Hydrogen Sulfide	0	–	2.0E+00	na	–	–	2.0E+00	na	–	–	–	–	–	–	–	–	–	–	2.0E+00	na	–
Indeno (1,2,3-cd) pyrene [C]	0	–	–	na	4.9E-01	–	–	na	4.9E-01	–	–	–	–	–	–	–	–	–	–	na	4.9E-01
Iron	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Isophorone [C]	0	–	–	na	2.6E+04	–	–	na	2.6E+04	–	–	–	–	–	–	–	–	–	–	na	2.6E+04
Kepone	0	–	0.0E+00	na	–	–	0.0E+00	na	–	–	–	–	–	–	–	–	–	–	0.0E+00	na	–
Lead	0	6.9E+02	7.9E+01	na	–	6.9E+02	7.9E+01	na	–	–	–	–	–	–	–	–	–	6.9E+02	7.9E+01	na	–
Malathion	0	–	1.0E-01	na	–	–	1.0E-01	na	–	–	–	–	–	–	–	–	–	–	1.0E-01	na	–
Manganese	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Mercury	0	1.4E+00	7.7E-01	na	5.1E-02	1.4E+00	7.7E-01	na	5.1E-02	–	–	–	–	–	–	–	–	1.4E+00	7.7E-01	na	5.1E-02
Methyl Bromide	0	–	–	na	4.0E+03	–	–	na	4.0E+03	–	–	–	–	–	–	–	–	–	–	na	4.0E+03
Methoxychlor	0	–	3.0E-02	na	–	–	3.0E-02	na	–	–	–	–	–	–	–	–	–	–	3.0E-02	na	–
Mirex	0	–	0.0E+00	na	–	–	0.0E+00	na	–	–	–	–	–	–	–	–	–	–	0.0E+00	na	–
Monochlorobenzene	0	–	–	na	2.1E+04	–	–	na	2.1E+04	–	–	–	–	–	–	–	–	–	–	na	2.1E+04
Nickel	0	5.9E+02	6.5E+01	na	4.6E+03	5.9E+02	6.5E+01	na	4.6E+03	–	–	–	–	–	–	–	–	5.9E+02	6.5E+01	na	4.6E+03
Nitrate (as N)	0	–	–	na	–	–	–	na	–	–	–	–	–	–	–	–	–	–	–	na	–
Nitrobenzene	0	–	–	na	1.9E+03	–	–	na	1.9E+03	–	–	–	–	–	–	–	–	–	–	na	1.9E
N-Nitrosodimethylamine [C]	0	–	–	na	8.1E+01	–	–	na	8.1E+01	–	–	–	–	–	–	–	–	–	–	na	8.1E
N-Nitrosodiphenylamine [C]	0	–	–	na	1.6E+02	–	–	na	1.6E+02	–	–	–	–	–	–	–	–	–	–	na	1.6E+02
N-Nitrosodi-n-propylamine [C]	0	–	–	na	1.4E+01	–	–	na	1.4E+01	–	–	–	–	–	–	–	–	–	–	na	1.4E+01
Parathion	0	6.5E-02	1.3E-02	na	–	6.5E-02	1.3E-02	na	–	–	–	–	–	–	–	–	–	6.5E-02	1.3E-02	na	–
PCB-1016	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1221	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1232	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1242	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1248	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1254	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB-1260	0	–	1.4E-02	na	–	–	1.4E-02	na	–	–	–	–	–	–	–	–	–	–	1.4E-02	na	–
PCB Total [C]	0	–	–	na	1.7E-03	–	–	na	1.7E-03	–	–	–	–	–	–	–	–	–	–	na	1.7E-03

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Pentachlorophenol [C]	0	7.7E-03	5.9E-03	na	8.2E+01	7.7E-03	5.9E-03	na	8.2E+01	--	--	--	--	--	--	--	--	7.7E-03	5.9E-03	na	8.2E+01
Phenol	0	--	--	na	4.6E+06	--	--	na	4.6E+06	--	--	--	--	--	--	--	--	--	--	na	4.6E+06
Pyrene	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
Radionuclides (pCi/l except Beta/Photon)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity	0	--	--	na	1.5E+01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	--	--	na	1.5E+01
Beta and Photon Activity (mrem/yr)	0	--	--	na	4.0E+00	--	--	na	4.0E+00	--	--	--	--	--	--	--	--	--	--	na	4.0E+00
Strontium-90	0	--	--	na	8.0E+00	--	--	na	8.0E+00	--	--	--	--	--	--	--	--	--	--	na	8.0E+00
Tritium	0	--	--	na	2.0E+04	--	--	na	2.0E+04	--	--	--	--	--	--	--	--	--	--	na	2.0E+04
Selenium	0	2.0E+01	5.0E+00	na	1.1E+04	2.0E+01	5.0E+00	na	1.1E+04	--	--	--	--	--	--	--	--	2.0E+01	5.0E+00	na	1.1E+04
Silver	0	3.7E+01	--	na	--	3.7E+01	--	na	--	--	--	--	--	--	--	--	--	3.7E+01	--	na	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,1,2,2-Tetrachloroethane [C]	0	--	--	na	1.1E+02	--	--	na	1.1E+02	--	--	--	--	--	--	--	--	--	--	na	1.1E+02
Tetrachloroethylene [C]	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
Thallium	0	--	--	na	6.3E+00	--	--	na	6.3E+00	--	--	--	--	--	--	--	--	--	--	na	6.3E
Toluene	0	--	--	na	2.0E+05	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	--	--	na	2.0E+...
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Toxaphene [C]	0	7.3E-01	2.0E-04	na	7.5E-03	7.3E-01	2.0E-04	na	7.5E-03	--	--	--	--	--	--	--	--	7.3E-01	2.0E-04	na	7.5E-03
Tributyltin	0	4.6E-01	6.3E-02	na	--	4.6E-01	6.3E-02	na	--	--	--	--	--	--	--	--	--	4.6E-01	6.3E-02	na	--
1,2,4-Trichlorobenzene	0	--	--	na	9.4E+02	--	--	na	9.4E+02	--	--	--	--	--	--	--	--	--	--	na	9.4E+02
1,1,2-Trichloroethane [C]	0	--	--	na	4.2E+02	--	--	na	4.2E+02	--	--	--	--	--	--	--	--	--	--	na	4.2E+02
Trichloroethylene [C]	0	--	--	na	8.1E+02	--	--	na	8.1E+02	--	--	--	--	--	--	--	--	--	--	na	8.1E+02
2,4,6-Trichlorophenol [C]	0	--	--	na	6.5E+01	--	--	na	6.5E+01	--	--	--	--	--	--	--	--	--	--	na	6.5E+01
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Vinyl Chloride [C]	0	--	--	na	6.1E+01	--	--	na	6.1E+01	--	--	--	--	--	--	--	--	--	--	na	6.1E+01
Zinc	0	3.8E+02	3.8E+02	na	6.9E+04	3.8E+02	3.8E+02	na	6.9E+04	--	--	--	--	--	--	--	--	3.8E+02	3.8E+02	na	6.9E+04

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
6. Antidegradation WLAs are based upon a complete mix.
7. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
8. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, Harmonic Mean for Carcinogens, and Annual Average for Dioxin. Mixing ratios may be substituted for stream flows where appropriate.

Metal	Target Value (SSTV)
Antimony	4.3E+03
Arsenic	9.0E+01
Barium	na
Cadmium	2.0E+00
Chromium III	1.4E+02
Chromium VI	6.4E+00
Copper	1.8E+01
Iron	na
Lead	4.7E+01
Manganese	na
Mercury	5.1E-02
Nickel	3.9E+01
Selenium	3.0E+00
Silver	1.5E+01
Zinc	1.5E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Analysis of the Shafffers ɔssing 002 effluent data : dissolved copper
Averaging period for standard = 4 days

The statistics for dissolved copper are:

Number of values	=	8
Quantification level	=	1
Number < quantification	=	0
Expected value	=	18.75
Variance	=	126.5625
C.V.	=	.6
97th percentile	=	45.62658
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for dissolved copper are:

Acute WLA	=	31.49
Chronic WLA	=	19.91
Human Health WLA	=	----

Limits are based on chronic toxicity and 1 samples/month, 1 samples/week

Maximum daily limit	=	29.11986
Average weekly limit	=	29.11987
Average monthly limit	=	29.11987

Note: The maximum daily limit applies to industrial dischargers
The average weekly limit applies to POTWs
The average monthly limit applies to both.

The Data are
3
2
20
11
37
24
16
37

Analysis of the shaffers (ssing outfall 002 effluen lata for dissolved lead
Averaging period for standard = 4 days

The statistics for dissolved lead are:

Number of values	=	6
Quantification level	=	1
Number < quantification	=	1
Expected value	=	2.024263
Variance	=	1.47515
C.V.	=	.6
97th percentile	=	4.925877
Statistics used	=	Reasonable potential assumptions - Type 1 data

The WLAs for dissolved lead are:

Acute WLA	=	258.43
Chronic WLA	=	29.36
Human Health WLA	=	----

NO LIMIT IS REQUIRED FOR dissolved lead

The Data are
3
3
2
1
1
<1

Analysis of the Shaffers (ssing Outfall 002 effluen lata for dissolved zinc
Averaging period for standard = 4 days

The statistics for dissolved zinc are:

Number of values	=	8
Quantification level	=	5
Number < quantification	=	1
Expected value	=	11.18678
Variance	=	45.05188
C.V.	=	.6
97th percentile	=	27.22211
Statistics used	=	Reasonable potential assumptions - Type 1 data

The WLAs for dissolved zinc are:

Acute WLA	=	196.18
Chronic WLA	=	177.69
Human Health WLA	=	----

NO LIMIT IS REQUIRED FOR dissolved zinc

The Data are
159
93
<5
21
33
41
14
20

Analysis of the NS Shaffer Crossing 002 effluent dat for ammonia
Averaging period for standard = 30 days

The statistics for ammonia are:

Number of values	=	1
Quantification level	=	.1
Number < quantification	=	0
Expected value	=	.2
Variance	=	.0144
C.V.	=	.6
97th percentile	=	.4866835
Statistics used	=	Reasonable potential assumptions - Type 2 data

The WLAs for ammonia are:

Acute WLA	=	8.55
Chronic WLA	=	1.95
Human Health WLA	=	----

NO LIMIT IS REQUIRED FOR ammonia

The Data are
.2